



Universidade do Minho
Escola de Economia e Gestão

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Determinants of the risk of household indebtedness: An analysis of the Portuguese Mortgage Market

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**Determinantes do risco de endividamento
das famílias: Estudo de caso em Portugal**

**Determinants of the risk of household
indebtedness: An analysis of the
Portuguese Mortgage Market**

Tese de Mestrado

Mestrado em Economia Monetária, Bancária e Financeira

Trabalho efetuado sob a orientação do

**Professor Doutor Carlos Alberto Arriaga
Taboleiros Costa**

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Abstract

Determinants of risk of household indebtedness: An analysis of the Portuguese Mortgage Market

Over the years, the level of indebtedness has increased gradually. Mortgage credit, on the one hand, has become one of the most important, financial obligations of the Portuguese households, as it covers about 80% of all loans. However, on the other hand, the mortgage credit has been able to boost some economic sectors in Portugal, such as construction. Therefore, it is important to study the determinants of the risk of indebtedness in the mortgage credit due to its impact on the households, on the banking system and on the real estate market.

At moderate levels, indebtedness improves welfare and increase economy growth, but high levels can be damaging. Therefore, this dissertation focuses on the study of the determinants of debt risk, specifically on the debt of Portuguese households.

The objective of this work is to analyze the factors that are mostly associated with indebtedness. I shall use a multiple regression model, with macroeconomic variables. So, we are going to be able to analyze if they affect the rate of household debt.

Have evaluated the variables, which had indicated previously, negative or positive impact. Thus, verifying that nearly all the expected results were confirmed. All variables in our model, namely, interest rate, saving, consumption, inflation rate and other variables are associated with the level of household debt, either positively or negatively. This study focused mainly on the concept of indebtedness, the indicators of indebtedness in Portugal, the factors that influence indebtedness and over-indebtedness, and also on the consequences of over-indebtedness and the growth of the indebtedness of Portuguese families.

Keywords: credit market; mortgage; debt; over-indebtedness; Multiple Linear Regression Mode.

Resumo

Determinantes do risco de endividamento das famílias: Estudo de caso em Portugal

Ao longo dos anos, o nível do endividamento aumentou gradualmente. O crédito hipotecário, por um lado, tornou-se uma das obrigações financeiras mais importantes das famílias portuguesas, uma vez que cobre cerca de 80% de todos os empréstimos. No entanto, por outro lado, o crédito hipotecário tem sido capaz de impulsionar alguns setores económicos, como a construção. Por este motivo, é importante estudar os determinantes do risco de endividamento no crédito hipotecário devido ao seu impacto nas famílias, no sistema bancário e no mercado imobiliário.

Em níveis moderados, o endividamento melhora o bem-estar e aumenta o crescimento da economia, mas altos níveis podem ser prejudiciais. Assim, esta dissertação centra-se no estudo dos determinantes do risco da dívida, especificamente sobre o endividamento no crédito hipotecário das famílias portuguesas.

O objetivo deste trabalho é analisar os fatores associados ao endividamento. No estudo será usado o modelo de regressão múltipla, com variáveis macroeconómicas para analisar se estas variáveis afetam a taxa de endividamento das famílias. Avaliam-se as variáveis, indicadas anteriormente os impactos negativos ou positivos. Assim, verifica-se que quase todos os resultados esperados se confirmaram. Todas as variáveis do modelo apresentada, nomeadamente taxa de juro, poupança, consumo, taxa de inflação e outras variáveis estão associadas ao nível do endividamento das famílias, de modo positivo ou negativo.

Este estudo incidirá principalmente sobre o conceito de endividamento, os indicadores de endividamento em Portugal, os fatores que têm influenciado o endividamento e o sobre-endividamento, e ainda sobre as consequências do endividamento e do crescimento do endividamento das famílias portuguesas.

Palavras-Chave: mercado de crédito; crédito hipotecário; endividamento; sobre-endividamento; Modelo de Regressão Linear Múltipla.

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List of abbreviations

BP – Bank of Portugal

DECO - Defesa do Consumidor

INE - Instituto Nacional de Estatística

OEC – Observatório de Endividamento dos Consumidores

GOEC - Gabinete de Orientação ao Endividamento do Consumidor

GAS - Gabinete de Apoio ao Sobre-endividamento

RACE - Rede de Apoio ao Consumidor Endividado

MLRM - Multiple linear Regression Model

OLS – Método dos Mínimos Quadrados

DEBT – accumulated mortgage debt

S – Saving

C – Consumption

U – Unemployment rate

Inf –Inflation rate

IR – Interest rate

HPI – House Price Indice

GDP – Gross Domestic Product

GDPg - Gross Domestic Product growth rate

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1. Introduction

1.1. The Problem Formulation

The rapid increase in household debt in the last twenty years has been an international phenomenon, which has also taken place in Portugal.

Many authors (e.g. Marques, 2005, 2010; Frade, 2007; Frade et al. 2008; Boudriga et al. 2009; Costa and Farinha, 2012; Magalhães, 2013; Nikolaidou and Vogiazas, 2013; Castro, 2013; Makri and Papadatos, 2014) have studied the determinants of indebtedness risk of households that were observed in many countries around the world over the past two decades. They said that the increase debt might have been a rational response of households to an easing of liquidity constraints resulting from financial deregulation and the decline in both nominal and real borrowing rates.

The stability of the international financial system has been through tough times in the past couple of years, after the bankruptcy of Lehman Brothers bank in the United States in September 2008. However, in order to avoid similar to the United States event that became the basis of the global financial crisis, and thus significantly worsened the financial results of the banking system around the world. It is necessary to identify the factors that affect credit risk, including the risk of over-indebtedness. The global financial crisis and the increased number of banking defaults around the world have emphasized the importance of credit risk management.

Since the beginning of the twentieth century, bank lending started to grow rapidly in Europe and, particularly in Portugal. The relationships between banks and households play an important role in the economic and financial literature and in the life of each person. Modern society cannot exist without credit. Households want to improve their life now and pay later.

Credit relationships are beneficial to us because we are getting goods, the financial institutions make profit from interest rates and whole country's cash flows – all this affects the economic situation. On the one hand, increased use of credit by consumers on the other hand gave impetus to the economy raise: construction, transportation, travel, restaurants, hotels, technology and many other products have been currently purchased on credit.

On the other hand, too much debt can lead to inability of households to repay their debts. All this can lead to over-indebtedness, which in turn can lead to illiquidity of banks and unstable economic situation. We have seen that imperfect banking credit system shook the world from 2008 to 2010.

Experience from 2008 to 2009 has shown losses suffered, as a result of credit defaults, that led to shrinking or rather freezing of credit markets. This may have been the result of an overall decline in economic productivity. For this reason, correct estimates of credit risk and probability of over-indebtedness are of tremendous importance to banks and financial institutions and households.

One of the problems arising from an increase of credit to individuals has been the over-indebtedness of the households. The involvement of citizens in demand for credit has resulted, on the one hand, in the decision of each individual for credit and the consequent offer of banking products to this segment of the market and, on the other hand, by the general conditions of the economy (Arriaga & Miranda, 2009).

The borrowing perspective is relevant now, and is considered particularly interesting, at the present time, given the rapid pace of mortgage debt accumulation in recent years. The cost of apartments or house is more front-loaded relative to income. So, most of households need to borrow large amounts of money to purchase their desired home. Another reason to concentrate on the mortgage market is that mortgage takes about 80% of all loans and the mortgage debt in Portugal is about 70% of its GDP, it is among the highest rates in the Eurozone. Therefore, it is necessary to identify the factors that affect mortgage debt of Portuguese households.

1.2. Objective

The objective of this work is to improve our understanding of credit risk, indebtedness risk, and over-indebtedness risk. To identify the macroeconomic determinants that significantly influence of household's debt. In this paper, we consider the causes and consequences of the increase in household mortgage indebtedness; to analyze the determinants of indebtedness on the mortgage market and their relationships modelled at Portugal's level.

For this study, it is fundamentally important to understand the question of growth of debt and to identify the factors of indebtedness risk. The key problem in the growth of debt is the possibility of over-indebtedness that has affected the sensitivity of household spending and has caused various economic shocks.

In this study, we focus firstly on the factors explaining the rise in household debt. Using simple models of household behavior and the change of the macroeconomic situation, empirically the possible contributions of a wide range of factors were explored.

By using statistic data, we can examine how macroeconomic factors (such as interest rates and house prices) and household-level factors (employment and saving) affect the household mortgage indebtedness.

This paper analyses the impact of the macroeconomic factors on the household indebtedness for Portugal mortgage portfolio covering a period from 2003 until 2015.

1.3. Dissertation Content

The project is organized as follows:

II Relevant literature - Includes a brief review of literature on mortgage loan, household debt, over-indebtedness and default to mortgage specifically in Portugal.

III The evolution of the mortgage market in Portugal - Provides relevant background information of mortgage market in Portugal.

IV Methodology / Theoretical Model / Plans and Tasks – This section has the intention to show how all the empirical processes will be developed. First, it shows all the information related to the used sample. Then, the econometric model is presented; the main variables, the dependent variable as well as the test of the hypothesis are explained. This section aims to present research methodology. It is designed to prove the hypothesis.

V Empirical Results – The set-up of the model is presented, including data collection, model calibration, the testing and validation of the model.

VI Discussion of Results – The main results are presented along with the discussions points.

VII Conclusions – The section summarizes the conclusions of the current paper and provides some recommendations for further research.

2. Literature Review

A little of literature, empirical studies and papers, on the effects of household debt have been completed for many countries including for Portugal. The objective of this thesis is to analyze the determinants of household debt. Only researches and literatures concerning determinants affecting household debt are reviewed here. Most of these studies have been publishing in the last decade.

This survey of the literature shows that, among the studies that examined the determinants of household debt most of them consider the macroeconomic environment as the most important factor in the determination of the debt risk.

Many studies have investigated macroeconomic factors that affect the debt risk. We mention, in particular, Marques et al, (2000); Frade (2003); Frade et al., (2008); Castro, (2013); Farinha & Costa, (2008, 2012); and similar studies Silva, (2009); and Magalhães (2013); among others, concentrate their research essentially on the influence of macroeconomic and social variables over the credit risk growth: indebtedness, over-indebtedness and default risks.

Credit risk (Sobehart & Keenan, 2007) can be defined as the potential that a borrower or counterparty will fail to meet its obligations (partially or totally) in accordance with the terms of a loan agreement. The analysis of the credit risk is essential because it can provide signs of alarm when the financial sector becomes more vulnerable to shocks (Castro, 2012).

According to Angelo & Sousa, (2011) the analysis of the credit risk can help the regulatory authorities to take measures to prevent a possible crisis and Heffernan (2005), the analysis of the nonperforming loans or risk of indebtedness is also important to prevent default. Hamerle, et al., (2011) agreed that credit risk is correlated with macroeconomic variables. In economic downturns, over-indebtedness increase (Mileris, 2012).

The aim of their paper is to analyze the link between behaviour and indebtedness. Behaviour leading to over-indebtedness is often put down to social and psychological factors. As a result, these individuals systematically underestimate the risk of not being able to meet their financial commitments (Anderloni & Vandone, 2010). According to the psychologist Márcia Tolli "The indebted is that person who plays for a risk." She does not know how to pay, but still buys. (Lypeza, Tenjob & Zbratec, 2010).

A stable banking system is prerequisite for economic growth (Rajaraman & Vasishtha, 2002), welfare (Kristo, 2013) and development (Makri & Papadatos, 2014) for the credit markets and the global economy. Moreover, Bairamli & Kostoglou, (2010) accentuate that economic growth ensures macroeconomic stability, develops strong financial institutions in order to transform savings into investments (Makri & Papadatos, 2014).

(Louzis, Vouldis & Metaxas 2010) The indebtedness, over-indebtedness and default is a natural phenomenon that inevitably touches a proportion of the households at any time and in any economic conditions. The level of debt, which the household becomes over-indebtedness, depends on many factors: the size and structure of the debt, the debt-servicing arrangements, and the assets of the household, other personal and economic characteristics of the household, as well as external factors such as the state of the economy.

In particular, Pesola (2005) using OLS model, Jimenez & Saurina (2006), Bohachova (2008) and Bonfim (2009) conclude that the result of wrong decisions of financing will become apparent only during the period of recession of the economy and this will cause the growth of over-indebtedness and loan losses (Cactro, 2013).

The household debt level is jointly determined by supply and demand. That is, the availability of funding, and the household's decision to take on debt. However, the macroeconomic environment ultimately determines both supply and demand (Meng, Hoang & Siriwardana, 2013).

The mortgage debt has immediate benefits as the buying a home with deferred payment, allowing the satisfaction of their needs in present in this at the expense of payment in the future. However, can harm, which affect the ability of borrowers to fulfil the related obligations, the consequences are over-indebtedness. The mortgage improves the comfort and the quality of life (Castro, 2013).

By Monteiro, (2010) the debt related to mortgage is one of the largest, since this is the largest investment that households make throughout their lives. This all, requires a greater financial effort. Moreover, this is revealed less risky, since the, getting of mortgage is seen as an investment, which has a value mortgage security, in this case a patrimony that covers the amount in debt (Vazquez, Tabak, Souto, 2012).

(Reinhart & Rogoff, 2010) indicate that over-indebtedness can be used to mark the onset of a banking crisis.

(Castro, 2013) studied the issue of credit risk. In this work the author divided the factors into two groups, the systematic and unsystematic credit risk, there are: macroeconomic factors like the employment rate, growth in gross domestic product, stock index, inflation rate, and exchange rate movements and so on.; specific factors to the households like their individual personality, financial solvency and capital, credit insurance, and so on.;

(Santos & Magalhães, 2004) divided the factors on into three groups: one related to the macroeconomic environment (evolution of the economic and housing situation, unemployment rate, and interest rate), another linked to socio-economic characteristics (age, sex, professional status, economic background, employment relationship, monthly income, and household size) and behavioural characteristics of households (number of credits in the bank etc. All these variables can have an important influence on the over-indebtedness of borrowers. (Castro, 2013) In his paper, was analyzed the link between the macroeconomic developments and the credit risk in a group of European countries. Employing dynamic panel data approaches to these five countries over the period 1997-2011, he conclude that the credit risk is significantly affected by the macroeconomic environment: the credit risk increases when GDP growth and the share price indices decrease and rises when the unemployment rate, interest rate, and credit growth increase.

According to (Makri & Papadatos, 2014) who studied, the determinants of credit risk, they found that macroeconomic environment significantly influence on the credit risk. The results of Generalized Method of Moments estimations indicate that unemployment, public debt, loans loss is positively effect on debt.

Das & Ghosh, (2007) studied the factors effecting the level of problem loans in India. They concluded that GDP growth, loan growth and bank size determine debt. Similar study analyzed the factors of debt (Magri, 2002) in Italia. The results suggested that age, income, living area, etc., have important effects on household debt.

Some studies analyzed the macroeconomic implications of rising household debt. They argued that the rise of household debt reflected the response of households to lower interest rates DeBelle (2004) and an easing of liquidity constraints (Marcus et al., 2000).

(Makri & Papadatos, 2014) they discovered that the GDP growth rate, unemployment, lending rates and the credit growth (Fainstein & Novikov, 2011) have a strong negative impact on non-performing loans.

(Angelo, Castro & Sousa, 2013) The link between the mortgage market developments and the macroeconomy has been extensively exploring for major industrialized countries. Have studied the macroeconomy such as the GDP growth, unemployment and financial variables such as the interest rate and the monetary aggregates. Sousa (2010a) relates the behaviour of housing wealth with the dynamics of future risk premium and Sousa (2012a) argues that investors using housing assets as a hedge against unfavourable wealth shocks. They uncover a very significant influence of domestic credit and interest rates. (Castro, 2013).

Results obtained by (Arriaga and Pinto, 2007) indicate that the major factors regarding over-indebtedness of Portuguese households are the activity sector of the head of the family, the weight of mortgage expenses on the family income and the employment composition of family members.

(Rebelo & Caldas, 2010) regard default, as the result of complicated events (e.g., unemployment, divorce) and a “drop in” income or job loss (Pennington-Cross & Ho, 2006) is the cause of over-indebtedness. Denis et al., (2008) conclude that typical trigger events (e.g., losing a job, severe illness, and breakup of a household) can lead defaults and prepayments depending on the amount of equity on the mortgage and expected income streams (Rebelo & Caldas, 2010).

In accordance with (Arriaga & Miranda, 2009), consumption level and a more favourable economic conjuncture are the main factors, to justify the increase of credit to households. Favourable interest rates and household revenue are the most mentioned indicators for high demand of credit.

With regard on the indebtedness of Portuguese families, (Costa & Farinha, 2012) have analyzed debt situations in 2010 and concluded that households with low income and young people with a mortgage are the most sensitive to the both macro and micro economic factors.

(Frade et al., 2008) sought to identify a profile of over-indebtedness in Portugal. These authors reported that over-indebtedness of Portuguese households are mostly married people with children. Families have an average level of education and work. The monthly income of these families varies between 500 to 1500 euros. Besides, over-indebtedness is the result of a combination of some loans - mortgage, car, credit card and one personal loan. These families were influenced by easy access to credit. On the other hand, the main reason that leads to over-indebtedness is the unemployment situation.

Zribi & Boujelbene, (2011) indicated that the macroeconomic indicators are determinant factors that influence bank credit risk-taking decisions. Indeed, the coefficients of rapid growth of GDP, inflation, exchange rate, interest rate and other are statistically significant with credit risk (Mileris, 2012).

The propensity of households to fall into the trap of excessive debt may be due to a certain number of factors (Frade and al, 2008). The individual factors, such as education level (for example, a lower education level is more associated with unemployment). Specific factors related to household composition (for example, a “drop in” income will have more impact on a single parent). The socio-cultural (for example, some cultures favor borrowing), the macro-economic dynamics of a country (for example, inflation rate, consumption, unemployment rate). Taking as an example a drop in the total income due to job loss, one might suppose that the unemployment rate of a country, has an important effect on the likelihood of the occurrence of over indebtedness. With regard on the increase in expenses, the country's inflation rate and economic oscillations may also have an impact on the frequency and extent to which people experience financial shocks. However, one can also expect that younger families, especially those with children, more sensitive to changes in consumer spending. (Frade & Lopes, 2009).

(Troisi, 2000) divided the determinants of household debt by categories. Macro-economic factors concerning the performance of the economy in general, as the rise in lending interest rates, the increase in the tax burden and the cost of living (inflation). Specific factors totally unrelated to the will and control of the family, unexpected events such as loss job, the onset of serious illnesses, death. Individual factors generated by a bad control in family incomes, as the exaggerated propensity to consumption, with the purpose to achieve certain social status.

After analyzing the research on this topic, we can say that debt and over-indebtedness may be influenced by several macroeconomic factors, such as GDP growth, the unemployment rate, the interest rate, PHI, savings, consumption etc.

According to (Farinha, 2008), the income of Portuguese families influence to household indebtedness. The importance of indebtedness in the families' budgets and their capacity to pay the debts

depends to their income level. According with this author, "when it comes to assessing the implications of the debt, either from the perspective of financial stability or in the macroeconomic perspective, it is essential to know in detail the distribution of the relevant variables, such as income," since their financial situation can be particularly sensitive to a significant drop in their income. The decrease income and the rising cost of living reflected in the slowdown of household saving, that is, in the slowdown in economic growth (OEC, 2002). The decrease in private consumption reflected in the slowdown of GDP growth, that is, in the slowdown in economic growth (OEC, 2002). Families at risk of over-indebtedness are more sensitive to unfavorable expectations of future developments in income then they consume less when faced with adverse shocks (OEC, 2002).

(Rinaldi & Sanchis-Arellano, 2006) argue that the probability of default depends on current income and the unemployment rate, which linked to the uncertainty regarding future income and the lending rates.

According to (Frade, 2003), the decrease in interest rates was a factor that greatly influenced the increase in credit to individuals, since in recent times families benefited from extra credit facilities, which gave them a much higher quality of life, thus being able to buy house, car, as well as commit to other additional expenses. While (OEC, 2002) indicate that increasing interest rates, coupled with low economic growth and the increasing allocation of savings to debt service, may eventually increase the over-indebtedness or credit default.

(Castro, 2013) analyzed the link between the macroeconomic developments and the banking credit risk in a particular group of countries – Greece, Ireland, Portugal, Spain and Italy (GIPSI). Concluded that credit risk increases when GDP growth and the share and housing price indices decrease and rises when the unemployment rate, interest rate, and credit growth increase; the credit risk increases when GDP growth and the share price indices decrease and rises when the unemployment rate, interest rate, and credit growth increase.

Household gross income includes wage income and gross mixed income, as well as domestic and overseas investment income. At the macro level, Gross Domestic Product can approximate these factors. (Meng, Hoang, Siriwardana, 2013).

3. The Indebtedness of Household in Portugal

3.1. The Problems of Mortgage Loans

The purchase or the construction of a home is one of the most important thing in people's life. Many people use mortgage to finance it. However, because of the large amount of money and time involved, mortgage indebtedness is probably the most important and difficult financial obligation in the life of every person.

Technological development, advertising, Internet and even pamphlet what we accept on the street has facilitated access to information (Ariaga & Miranda, 2009; Farinha, 2008), thereby increasing the types and quality of services. This led to the growth of bank capital. At the same time, this flow of capital accelerates the participation of banks in credit.

Over the past 20 years, relationships between banks and consumers of banking services has increased significantly (Marques et al., 2000). The standard of expenditure has changed: housing expenses, transportation, technology, travel, restaurants and hotels have gained momentum favoring the demand for credit, since many of these goods are buying on credit. Increased competition among banks also enabled access to credit to a wider range of families, who are leading throughout the nineties to a rapid increase of their debt (Farinha, 2008).

According to the "*Observatório do endividamento dos consumidores*" (OEC, 2002) the growth of household indebtedness has reflected the rational adjustment of households and financial institutions to change on the supply and demand of credit.

Increased competition in the banking credit market, a result of financial deregulation, led banks to bet on a market for loans to households. The financial deregulation and increased competition of the banking sector led banks to focus on household loans. OEC¹ (2002) have taken in account the low level of household debt in relative terms and the elimination of access to credit liquidity constraints resulting from the decline in nominal interest rates and credit limits (Marques, 2000). Openness to the consumer credit market has led to intense competition among them, allowing banks to obtain high profits, and the households each year go more in debt (Kilborn, 2005). It Also provided access to credit to a wider range of families (Farinha, 2004, 2005). This has leading them to a rapid increase of their debt, throughout the nineties.

On the demand side, the economic determinants of the sharp growth in credit, mainly related to the slight decline in the unemployment rate, rising disposable income and with the sharp decline in interest rates (Gomes, 2011).

The increase in credit supply was characterized by the elimination of the mechanism that limits competition in the credit market (Marques, 2000). The increasing of credit (Gomes, 2011) in recent years, especially mortgage loans, also aggravated this consumerist behaviour. Access to easy credit (Frade, 2003) and the huge variety of entities that provide it led to the indebtedness of many Portuguese families (Marques, 2005, 2010).

The term credit comes from Latin “creditum” meant belief or confidence. In economic terms, this concept tells us that the supplier can trust the demander the capacity and the intention to pay later for goods and services that acquired at present.

In accordance with the Bank of Portugal, the supply of credit in Portugal, alongside other markets, is divided into two main types of credit: mortgage loans and consumer credit. Residential mortgage is a subdivision that includes credit acquisition real estate and related credit. The mortgage loans, compared to others, have less degree of risk, in that it has the collateral of the property mortgage, which was evaluated by the bank. However, this type of loan amounts a high percentage of the total amount of Portuguese household debt.

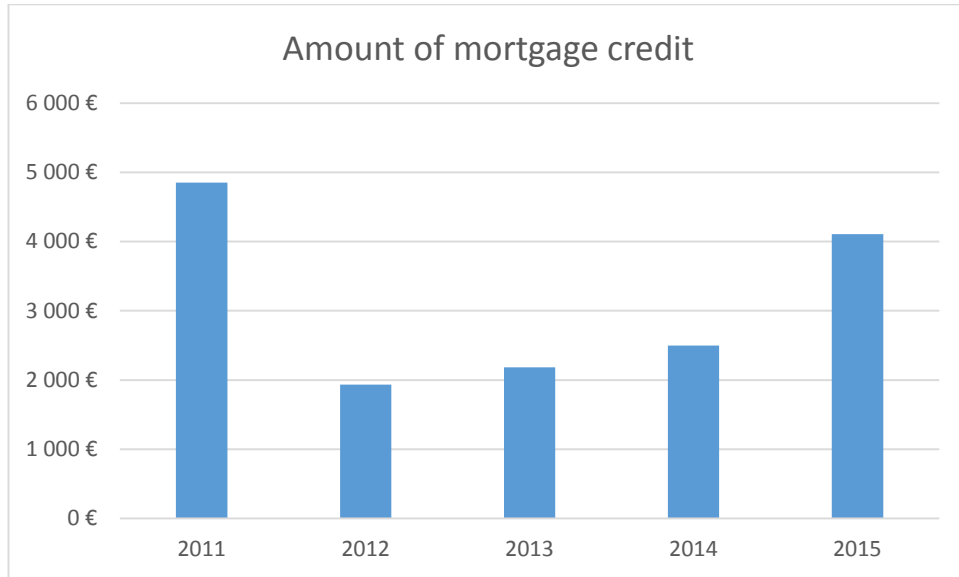
The mortgage lending is regulated by Decree-Law № 349/98. This law defines the standards for the mortgage lending in the general plan and subsidized credit plans and young subsidized loans. «Under the law, housing loans are intended for the acquisition, construction and renovation of a permanent or secondary one's own or leasehold housing, as well as for the acquisition of land for housing construction (Monitoring Report, 2015). »

3.2. The Evolution of Mortgage

Based on the data published in 2015 by the Bank of Portugal in the Monitoring Report, 2015, it is possible to understand consumer behaviour in the mortgage market. In Figure 1 shows evolution of the granted mortgage from 2011 to 2015. We can see a rapid decrease for mortgage loans relative to 2011. Later, there was an increase during 2013 - 2014, of 10.2% and 16.6% for mortgage loans, respectively. In 2015, signed a 49,308 mortgage loans contracts, an increase of 49.5%. The amounts of these contracts was 4.1 billion euros. We can see that in 2015 the amount of loans increased twice compared

to 2014, but still lower relative to 2011(Monitoring Report, 2012-2015, Relatório de Estabilidade Financeira 2004-2010).

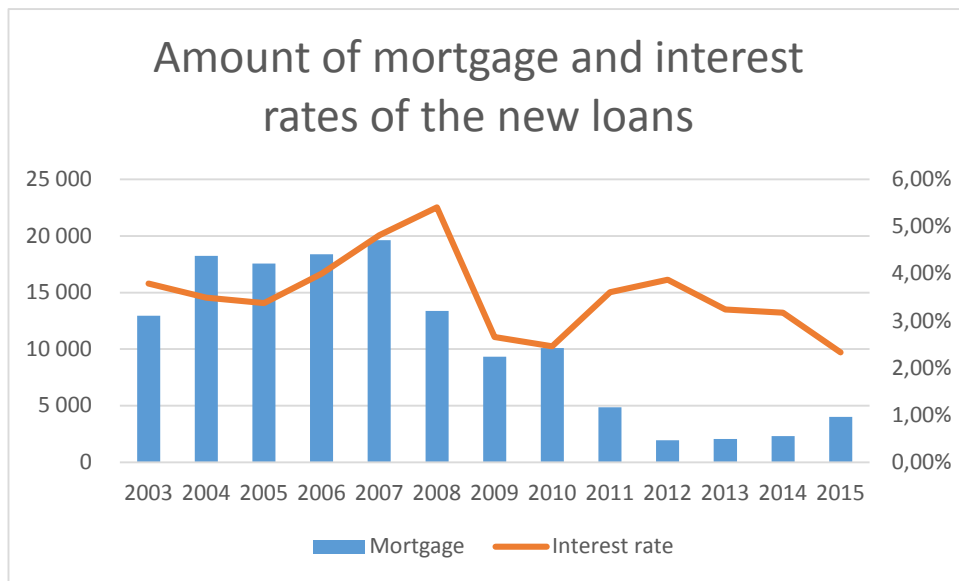
Figure 1 - Evolution of the mortgage of the Portuguese households from 2011 to 2015 in 10⁶ Euros.



Source: INE, BP Stat

Figure 2 presents amounts of mortgage loans and interest rate on new credit operations of mortgage. During 2003 to 2007, interest rate was increasing all the time, from 3.79% to 4.82%. When the amount of mortgage loans reached its peak of 19.6 billion was in 2007. In the crisis period of 2008, the interest rate reached the maximum of 5.41% and amount of loans fell in 13.4 billion. However, in 2009 when interest rates fell sharply to 2.66% amount of loans also decreased in 9.3 billion relative to 2007. However, in 2012 interest rates rose to 3.87% but the amount of mortgage loans decreased up to 1.9 billion. One explanation for this may be that in unstable crisis period when unemployment rises and incomes fall, when people do not trust banks and not confident in the future, the families did not borrow. All that, made the mortgages loans less and less appealing to households. This may prove because the amount of loans and mortgage loans decreased comparing to the pre-crisis period. However, the situation changed. In 2015, the interest rate was lower than in the crisis period 2.33% as opposed to 2.66% in 2007 and the amount of loans increased up to 4.0 billion almost twice compared to the year 2014.

Figure 2 - Evolution of mortgage and interest rates of the new loans from 2003 to 2015 in 10⁶ Euros.



Source: INE, BP Stat

On the figure 2, we can see that despite the increase in interest rate remain low and are lower than 2007 years. Before the crisis, which has been relatively stable for households, mortgage market developed by increasing the number of mortgage loans.

The last 20 years in Portugal, were times of sharp increase in consumption credit. The housing sector was no exception, quite the contrary. However, after the crisis mortgage loans fell sharply. Since 2014, loans have been slowly increasing.

3.3. The Evolution of Interest Rate

The mortgage is satisfactory for all parties that allows the provider to sell the stock and make a profit, the consumer purchasing the goods that otherwise is not possible, and the banks get profit, interest rates. Therefore, a mortgage is relevant now. Is important that the customers have been informed of his rights and obligations, know the main credit characteristics and the terms of the related contract, in addition to the components of the cost (especially the interest rate).

When a household decides to take credit, especially mortgages, considering long period and large size of the loan, must rely on financial literacy. Understand how the interest rates will be building, what is "SPRED" and other financial terms, not to commit mistakes and not get into a situation of over-indebtedness.

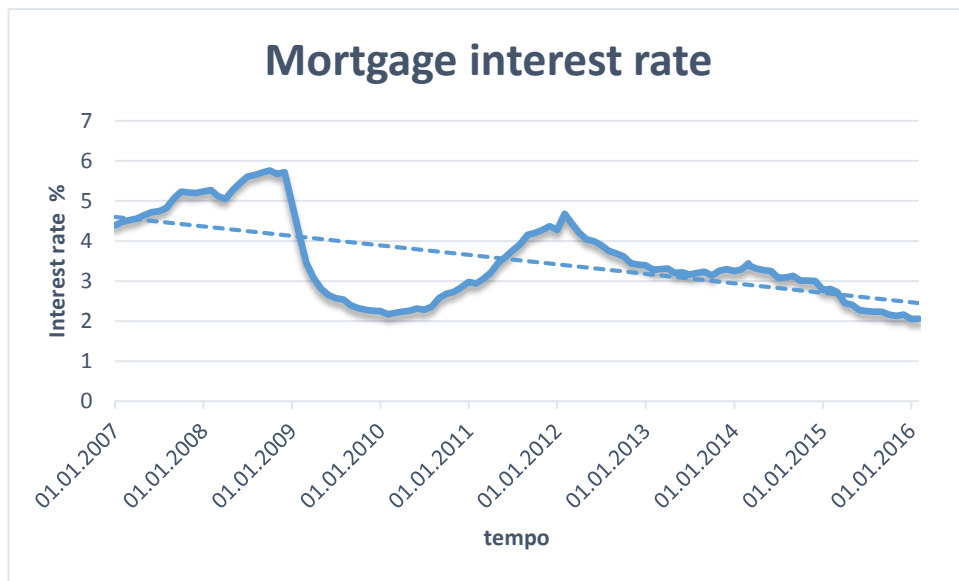
In accordance with the Bank of Portugal², mortgage loans are one of the most important financial commitments in people's lives. In addition, the mortgage loans are usually long-term and the property purchased with the loan serves as collateral (mortgage). The maximum amount in 2015 to 190,000 euros or may not exceed 90% of the appraised value of housing (loan-to-value). Maximum term - 50 years. The mortgage loans can be contracted with a variable interest rate³ or a fixed interest rate. The interest rate is only one of the components of the "price" payable on the loan and is calculated in accordance with Decree-Law no. 240/2006, of December 22. The interest rate on these loans is the sum of two components: the reference rate (benchmark rate) and the spread⁴ (margin). The rate Euribor3 is the rate used in credit operations, the customer chooses to different deadlines to Euribor 3, 6 and 12 months. In each contract, the credit institution, taking in account the customer's credit risk and the ratio between the value of the loan and the property value (Loan-to-Value), freely assigns the spread. The variable interest rate for home loans is the sum of two components: the index (reference interest rate) and the spread (margin). The interest rate Euribor is the rate used in credit operations, the customer can choose from different periods, the most common being the Euribor 3,6 and 12 months. The spread is a component of the nominal annual interest rate of the loan. The spread is the margin that adds to the value of the chosen indexer.

In fixed-rate home loans, the installment loan will remain constant for the period established for this rate in the contract. The fixed rate period may not match the total of the loan term. Fixed rates applied by credit institutions take as reference the swap rates by adding a spread.

According to the Retail Banking Market Monitoring Report, 2015, contracts made in 2015 were mostly variable rate contracts, which make up almost the entire housing loan portfolio of 87.6 percent. The most common index of the variable rate at 89.5% is the Euribor at 6 months it was used in about 59.3% of the number of contracts in 2015.

In the period from 2007 to 2008, we found that the interest rates applied to new mortgage loans ranged from 4.39% in January 2007 and 5.72% in November 2008, as might see in the Figure 3 below. Regarding interest rates, after the bankruptcy of Lehman Brothers in September 2008, the confidence index fell abruptly, and consequently interest rates also declined considerably by 2.2%, due to the intervention of central banks, in an attempt to mitigate Recessive effects of the financial crisis. However, the situation reversed shortly afterwards with the onset of the crisis, in February 2012 it increased to 4.7% and thus had a negative effect on the financing costs of both non-financial corporations and private individuals, mainly in housing loans. Bank of Portugal data for May 2015 indicate that the interest rate recorded was 2.1% as shown in the chart below.

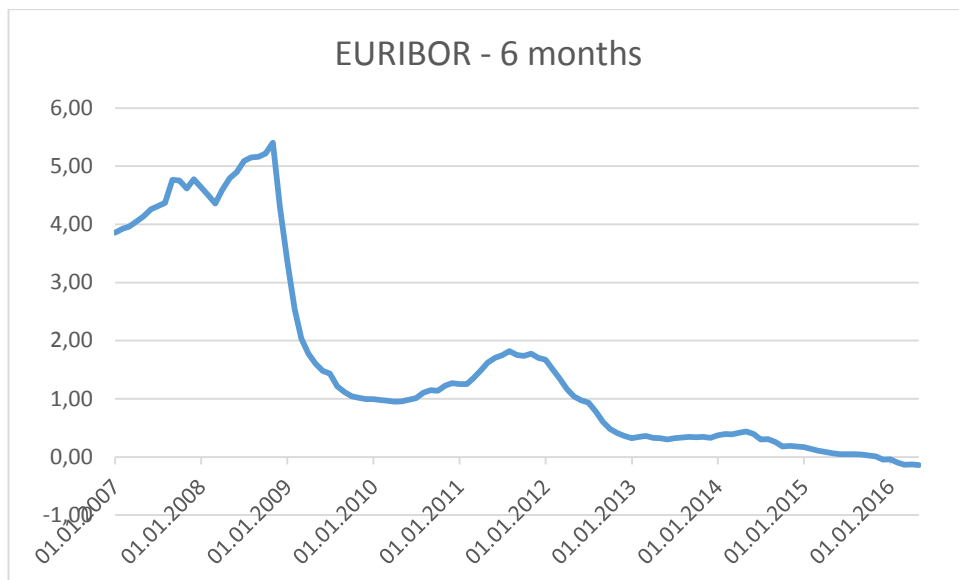
Figure 3 - Evolution of the mortgage interest rate of a new mortgage from 2007 to 2016



Source: BP Stat

After the Euribor⁵ rates reached the level of 5% from 2007 to 2008, today is observe the opposite trend decline to -0.5% in 2015. However, historical lows of the Euribor rate will have reached in the future.

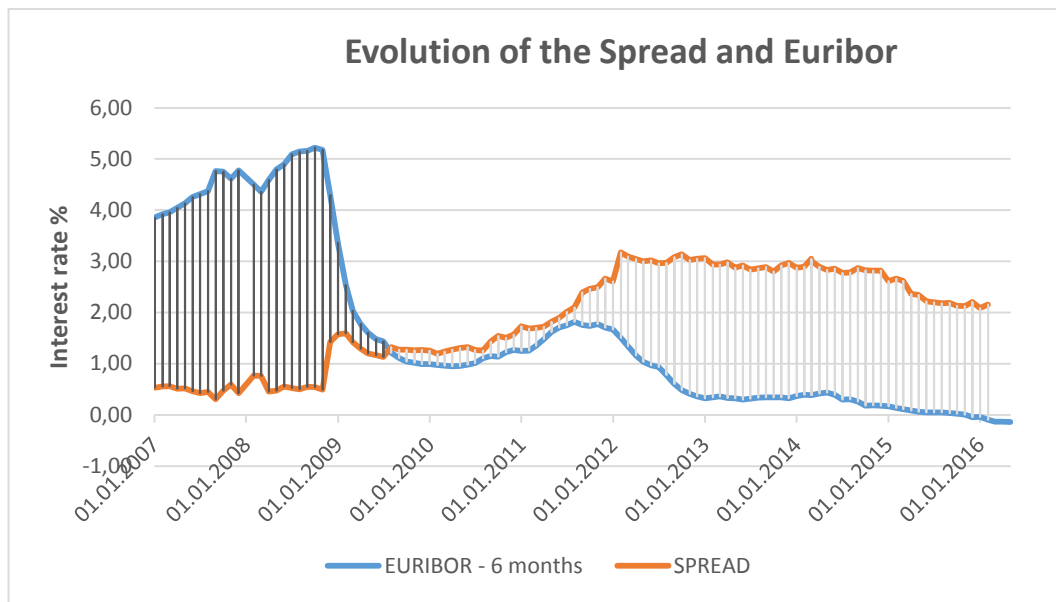
Figure 4 - Evolution of the Euribor 6 months from 2007 to 2016



Source: BP Stat

Knowing that the interest rate applied is made of two elements: Euribor (Figure 4, 5) + Spread (Figure 5), we can see that spreads from 2007 to 2008 ranged from 0.53% to 1.43%. In this period, the spreads have low values and not showing an anticipation of the 2008 financial crisis.

Figure 5 - Evolution of the Spread and Euribor from 2007 to 2016

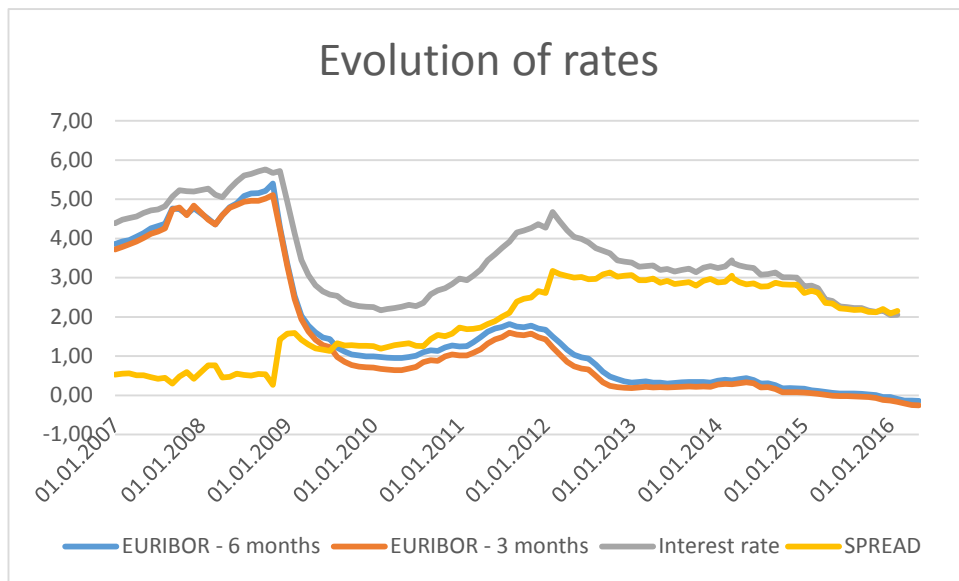


Source: BP Stat

These were low Spreads. We can verified that the lowest spread of 0.27% in 2008 also registered the highest Euribor value of 5.405%, which resulted in an interest rate of 5.67% (Figure 4). The Figure 5 shows the evolution of the Spread and the Euribor from Jan 2007 to May 2016. We can see that from 2012 to 2016 we have clearly higher spreads than those, which was recorded from 2007 to 2011.

As a result, in Figure 6, in April 2014 we recorded a spread of 2.89%, which added up to Euribor of 0.418%, resulting in an interest rate of 3.31%. We can see that in October 2014, the rate was already low at 0.181%, and in December 2015, it registered a historical low of - 0.045%. The Euribor rates to three, 6 and 12 months continue to fall today. The six-month rate, the most used in mortgage loans. In 2011 registered the highest rate of 1.818%, whereupon began to decline. In December 2015 a record low about to -0.05% was reached. Continued to decline during 2016 is about to -0.14% in May.

Figure 6 - Evolution of the average spread interest rate and Euribor from 2007 to 2016



Source: BP Stat

Can appears at first view that the mortgage loan is "more expensive" now, because it has a higher spread. After this analysis, we find that today the global interest rate is 2.36%, being lower than when were recorded the historical lows of spread.

According to the figure 6, the evolution of rates over nearly nine years, we can conclude that the evolution of the spread is inverse to the Euribor. We can see that for the same period, that is, when Euribor is high, spread is low and vice versa. This means that even if in the future Euribor achieve higher values again, there will be a tendency of spread to decrease. A variable interest rate of mortgage to repay is in accordance with the movement of the Euribor. When Euribor rises, the interest rate to repay increases and vice versa.

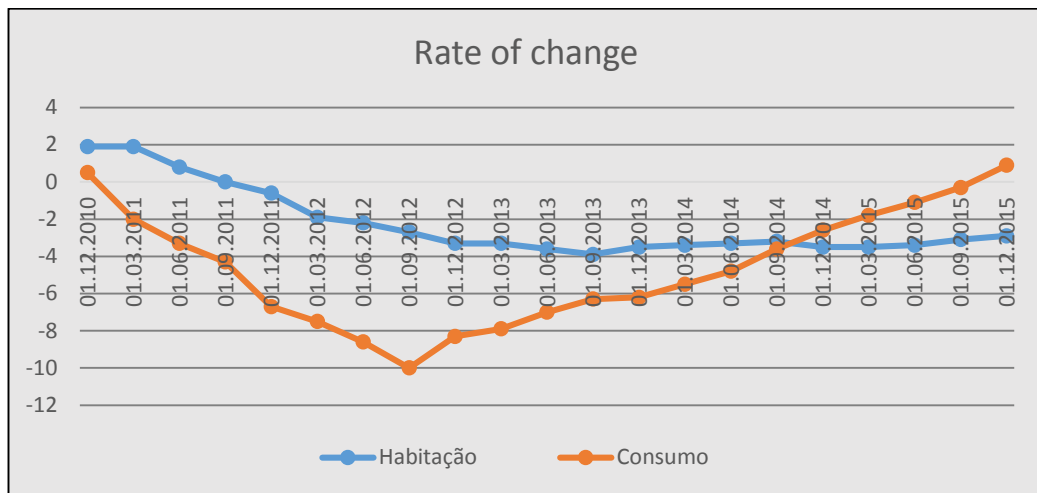
In the figure 6, we can see that despite the increase in interest spreads mortgage interest rates remain low and are lower than in the 2007.

3.4. The Indebtedness of Portuguese Household

The increase and high levels of debt of households, in recent years has caused great concern in most of the euro area and beyond. The latest financial crisis have shacked the economic stability of the world. Have been violated the interests of households in particular.

However, for a better understanding of indebtedness of individuals, we will talk about the mortgage, as this is the main debt of Portuguese families, because of the large amount of money and long credit period. In recent years, mortgage loans decreased in Portugal. We can see in figure 7, the rates of annual variation of credit is negative from 2010-2015.

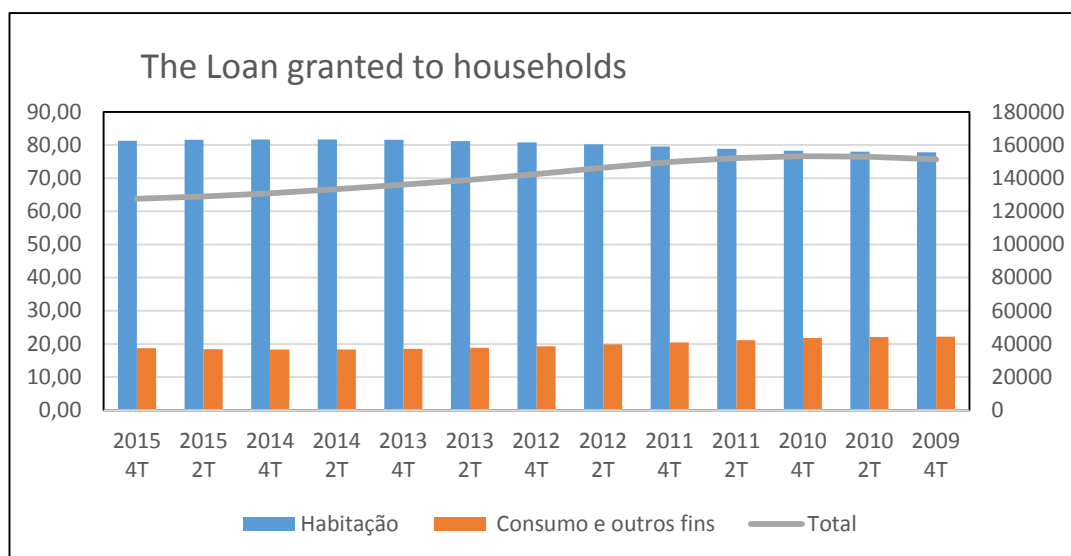
Figure 7 – Rate of change - bank loans from 2010 to 2015



Source: BP Stat

Total debt on mortgage loans in 2009 drew up 117 785 representing 77.8% of total household debt and in 2015 – 103 649 that made up 81.3% of total household debt. We see that the debt has tendency to decrease but household's mortgage debt remains high (See figure 8).

Figure 8 – The Loan granted to households from 2009 to 2015

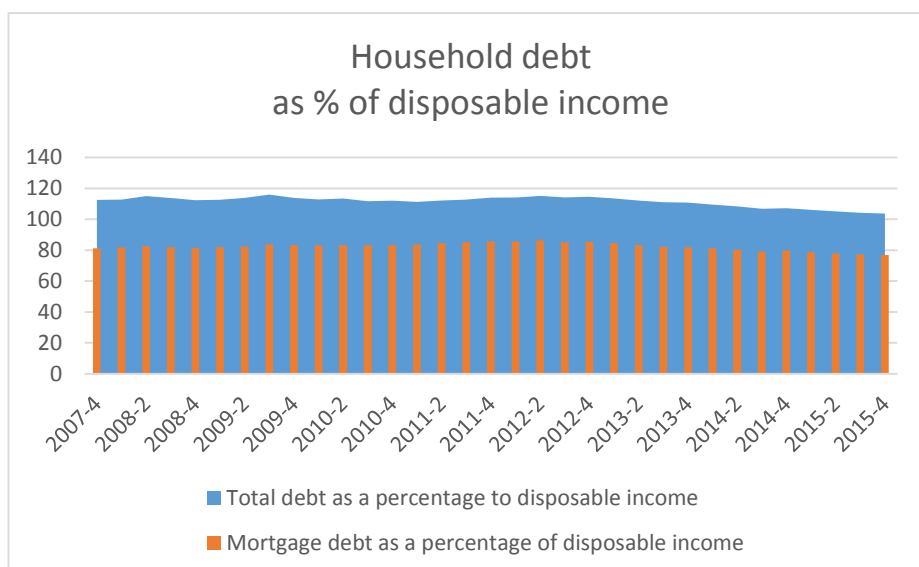


Source: INE, BP Stat

In recent years, even though the level of debt still tends to be decreased remains at worryingly high levels. The weight of credit to housing is considerably higher than consumption. Given the historically low interest rates, in 2010 there was a slight increase of the loan to families, primarily through mortgage loans.

From a general perspective, the loans have decreased since 2010, which is more pronounced slowdown in terms of consumption loans, among several factors in the post-crisis period such as the decline in consumer confidence, increased restrictions on lending, increased unemployment rate, among others.

Figure 9 – Household debt to disposable income from 2007 to 2015



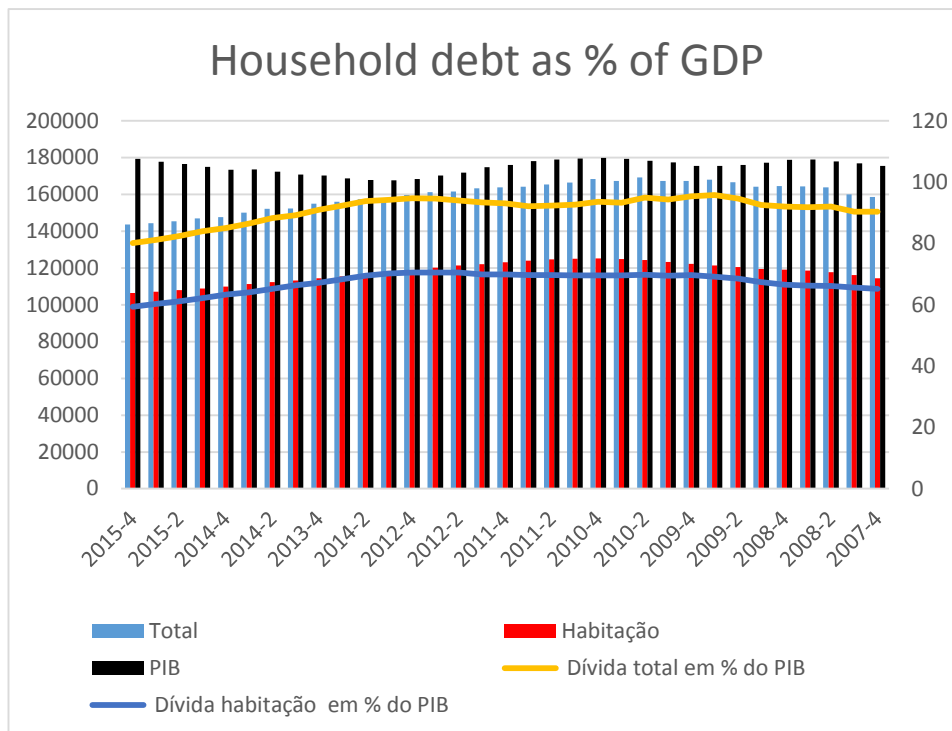
Source: INE, BP Stat

The mortgage is a main part of the amount of household debt. The main source of debt accumulation is the growth of loans of the pre-crisis period. In 2007, the housing loans of households amounted to 81.2% (see figure 9) of disposable income in Portugal, and then slowly grew to 86.3% in 2012. From 2012, the mortgage loans, as a percentage of disposable income started to decrease slowly, in 2013 to 82% and in 2015 about 78%.

Over the two past decades, in Portugal, as in most developed countries, the growth of household debt has increased. The financial crisis spread across the real economy, triggering a worldwide economic recession. In 2009, the major economies showed a real decline in gross domestic product, such as United States (-2.4%), Euro zone (-4.1%), United Kingdom (-5.0%) and Portugal (-3%).

Indeed, debt is a very important component of the real estate sector. Due to the high prices of properties, most households use debt to finance the purchase of a home, this is a very serious commitment giving that it is required a large amount of money and a long period. Therefore, the use of mortgage has been the only choice more people have, to be able to acquire a property.

Figure 10 – Loans to GDP from 2007 to 2015



Source: INE, BP Stat

According to data released by the INE the Portuguese economy or GDP registered an increase of 1.3% in 2015. At the 2015, there was still a reduction in granted mortgage, also increased the level of credit defaults (see table 1).

Currently, the debt of Portuguese families is very high (see figure 10). In fact, official data from 2007 Q4 indicate that total household debt amounted to 90.4% of GDP, equivalent to approximately 158 672 billions and debt of households of mortgage amounted to 114 512 billion Euros. In 2015 amounted to 106416 billion Euros, about 59.3%.

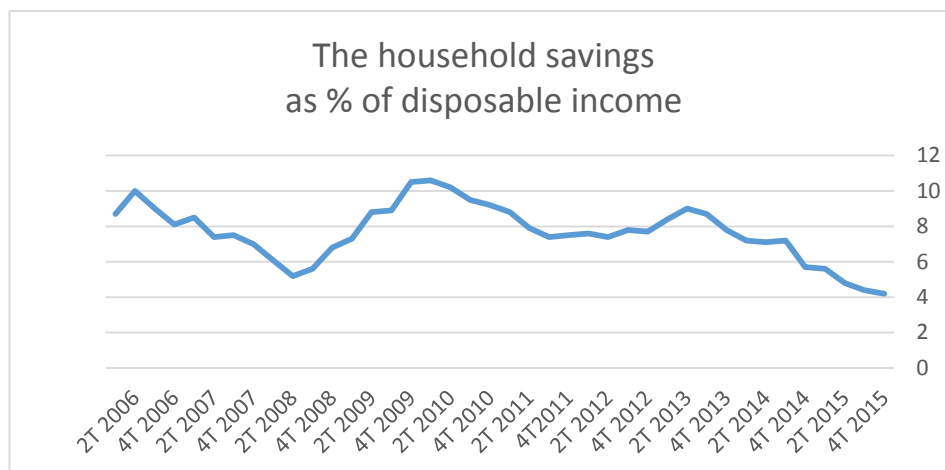
In the figure 10, we can observe the growth of household debt from 2007 to 2010 as the total debt and the debt of mortgage. That shows that during the crisis and the post-crisis period economic uncertainty and increasing unemployment has made an impact on the households. However, Portuguese households mortgage debt has considerably decreased since 2010, when it stood at 125191 billion Euros, about 69.6% of GDP; in 2011, it stood at 123146 billion Euros, about 69.9% of GDP; in 2012, it stood at 118867 billion Euros; in 2015 stood at 106,416 billion Euros, about 59.3% of GDP. Thus, between 2007 and 2015 the household debt decreased in absolute terms by approximately 14973 billion Euros in total debt, which is a significant reduction by 8096 billion Euros in mortgage.

The Portuguese economy has experienced instability in recent years as a result of the international economic crisis and sovereign crisis. Now, mortgages loans amount about 59.3% of Portuguese households and 80.1% of their total debt. Given that households have faced with a decrease of income, tax increase, increasing cost of life, etc., it appears that families make great efforts to reduce its debt. The indebtedness of families is becoming actual problem in Portuguese society as well as in the world. It is enough to look at some indicators of household indebtedness, to verify that there has been a significant increase in household indebtedness in recent years.

According to the OEC, 2002 the concept of indebtedness of households is usually associated with the outstanding balance of credit commitments, credit for consumption or the mortgage loans. All these credits are the main source of indebtedness of Portuguese families because of the high-cost purchases.

There are several factors that could explain the increase in the household debt. First, the consumer culture has increased. We all want to live in a nice house, do renovations to our apartment, buy the best furniture, appliances, cars, computer, mobile phones, etc. Unfortunately, since most of us cannot afford to do it all at once, we use debt to finance it. Secondly, because unemployment rate and the living expenses have increased, it has become very hard for families to have money on saving. The savings, does not improve, as you can see it in figure 11.

Figure 11 - The household saving to disposable income from 2006 to 2015

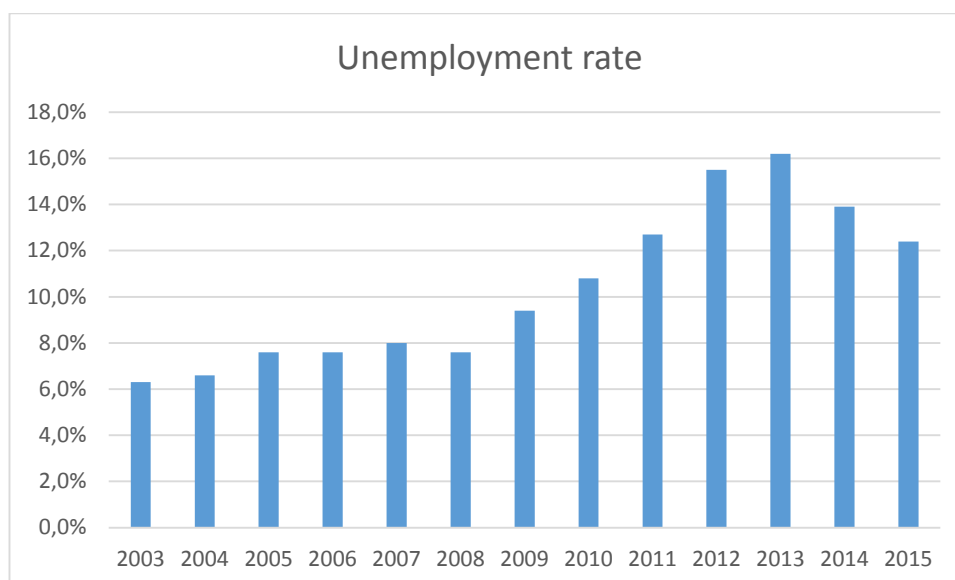


Source: INE, BP Stat

Analyzing figure 11 we can say that in the period from the second trimester of 2006 to the first trimester of 2008 the level of household savings dropped from 10% to 5.2%. We can assume that in this period households increased their consumption and their loans. However, from the second trimester of 2008, to the second trimester of 2010 the saving rate of households started to rapid increase and went from 5.2% to 10.6%. It confirms that due to the instability and the lack of hope in the future or when not confident in the future, households started to reduce consumption and increase savings. Unfortunately, since 2010 to 2015 we have seen a sharp decline in the savings rate of households as the 4th trimester of 2015 reached the lowest value of 4.2%.

Strong growth was mostly related to the slight decline in the unemployment rate, with the sharp decline in nominal and real interest rates (Gomes, 2011). You can see this in figure 12.

Figure 12 - Unemployment rate from 2003 to 2015



Source: INE

Relatively low unemployment rate, before the crisis, contributed to the increase in consumer lending. However, from 2009 to 2013 unemployment rate increased sharply and marked negatively on the reduction of mortgage loans to households. The negative consequence of the unemployment rate growth we are able to see in the debt growth over the same period. Since 2014, the rate has dropped to 13.9% and reduced the level of debt.

To a certain point, debt by itself is not the problem, the problem starts when we miscalculate "account, weight and measure". Debt problems only start only when households are unable to bear the costs of contracted credits, generating situations of over indebtedness. There have been many cases exist in which people who accumulate credits; three, four, five or more credits (mortgage loans, car loans, holiday loans, loans for the purchase of household appliances, etc.) (Marques, 2000). Because they use debt to finance the purchase of a home, a car, a trip, home appliances or to acquire other goods and services. Sometimes they get new loans even before they have finished paying the previous ones, so the interests make them to get into an over-indebtedness.

It seems clear, why many families become unable to meet their financial commitments. Many factors influence on the financial condition of households, which will be study below.

3.5. The Over-Indebtedness of Portuguese Household

The credit risk (risk of over-indebtedness) is the risk of loss resulting from the breach of the payment plan agreed by the debtor in a lending operation. (GOEC). The over-indebtedness, also known as bankruptcy or insolvency of individuals, include cases in which families are in a situation of inability to pay one or more debts (MARQUES, Leitão, et. al., 2000). The over-indebtedness is the accumulation of debt by the consumer these debts exceed their monthly income (OEC, 2002).

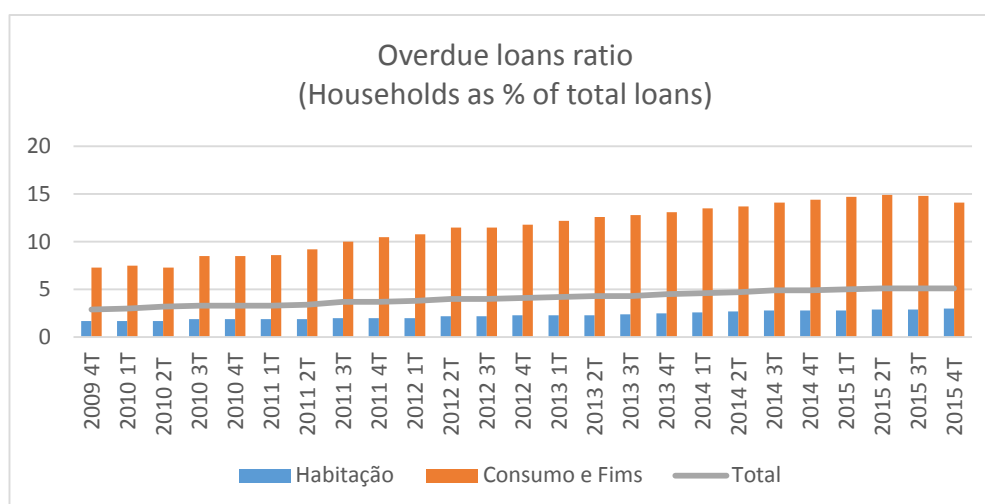
Increase of over-indebtedness in Portugal and in the euro area is the result of the global financial crisis and subsequent economic recession in the context of over-indebtedness. Portugal is one of the countries in the euro area, most affected. The overdue mortgages payments of Portuguese households, in the banking sector, increased twice from 2007 to 2015.

Table 1 - Household debt from 2014 to 2015

	Dez-2015	%	Dez-2014	%	Variation	
Loans granted						
Mortgage	103 649	81.3%	106 889	81.6%	3%	3 240
Overdue loans						
Mortgage	3 138	3.2%	2 987	2.9%	5,10%	151
Nº of borrowers						
Mortgage	2 296.4		2 312.4		-0.7%	
% Of debtors with overdue loans						
Mortgage	6.4%		6.4%		0%	
Loans granted, new operations						
Mortgage	4 013		2 314		1 699	

As can be seen on the table 1, between the end of 2014 and the end of 2015, total mortgage granted to households decreased by 3% (-3.2 billion euros). The mortgage, which represent about 80% of total loans to households, there was increasing of 5.1% in overdue credit (totaled 3.1 billion euros). We can see table 1 the weight of overdue loans, housing, increased from 2.9 in 2014 to 3.2% in 2015.

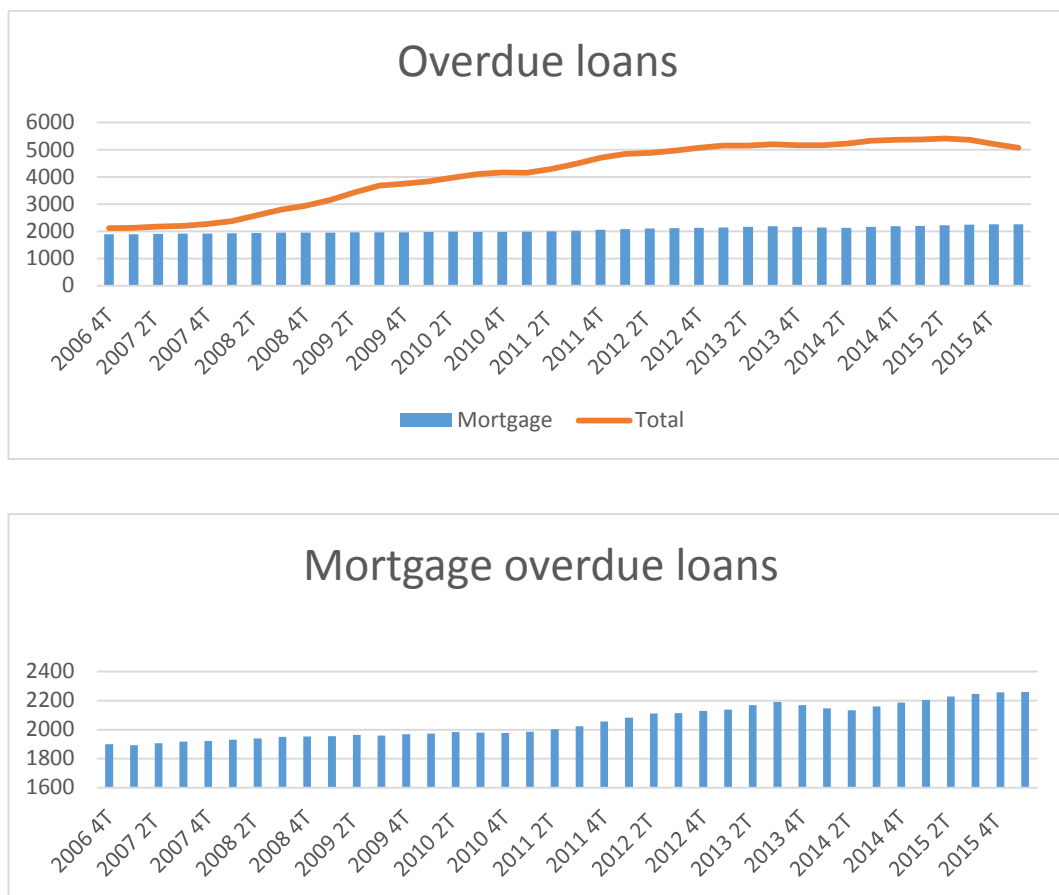
Figure 13 - Ratio of overdue loans from 2009 to 2015



Source: INE, BP Stat

With the growth of unemployment rate (Figure 12), which was responsible for the decrease of a considerable part of the income, the overdue loans ratio (Figure 13) of households increased, in 2007 to 1.7% and in 2015 to 3%. At the end of 2015, overdue mortgage loans totaled 3.1 billion euros, representing 3% of total credit granted, compared to 2.8% in 2014. According the data of, in the second quarter in 2013, this ratio was 4.3% of total loans (2.3% on housing loans and 12.6% in consumer credit) and 15.5% households with loans are in default.

Figure 14 a, b - Overdue loans: Mortgage and Total from 2006-2015

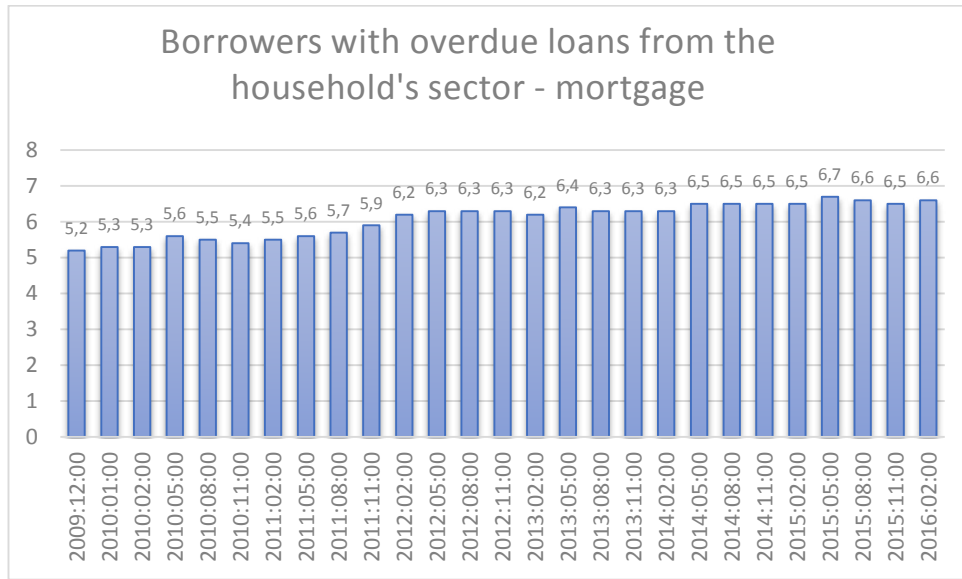


Source: BP Stat

The high level of overdue loans is the result of the flow of non-compliance, which was especially pronounced between late 2007, and mid-2014, and the slow resolution of overdue loans of 2015 and first quarter 2016 (Figure 14 a,b).

A high level of overdue credit is usually associated with excessive leverage, and also has negative impacts on credit demand (Goretti & Souto, 2013, and Bending et al, 2014).

Figure 15 - Households with non-performing loans relative to the total number of people with mortgages from 2009 to 2016



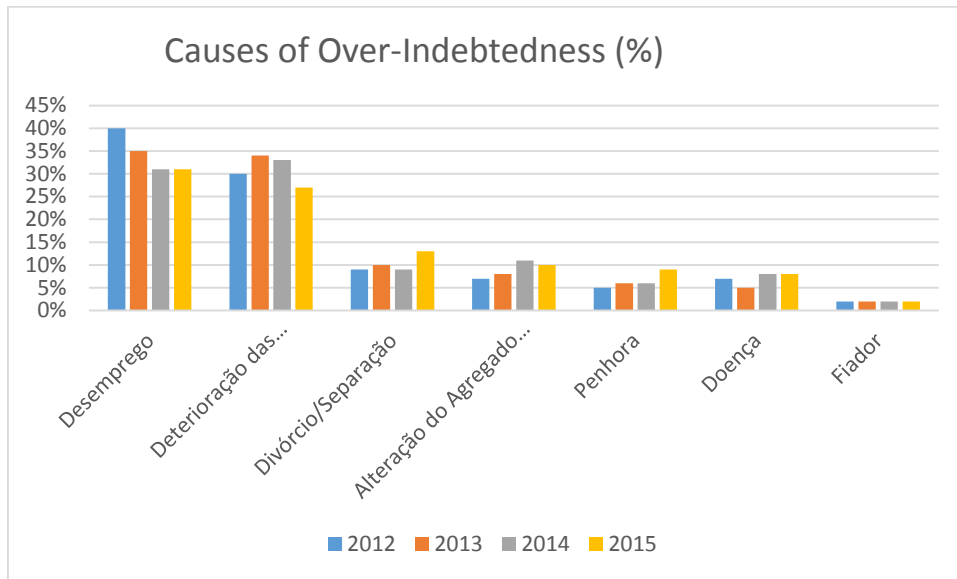
Source: BP Stat

In the figure 15, is represented the percentage of borrowers with overdue mortgages loans. Households with loans from financial institutions failing to pay within the due date relative to the total loans of mortgages. You can see a rise from 5.2% in 2009 to 6.6% 2015.

The over-indebtedness does not have a standard definition, but it can be defined as the inability to make the payments of a certain amount owed, due to current income or to the lack of funds obtained from the sale of assets (Anderloni and Vandone, 2008, 2010).

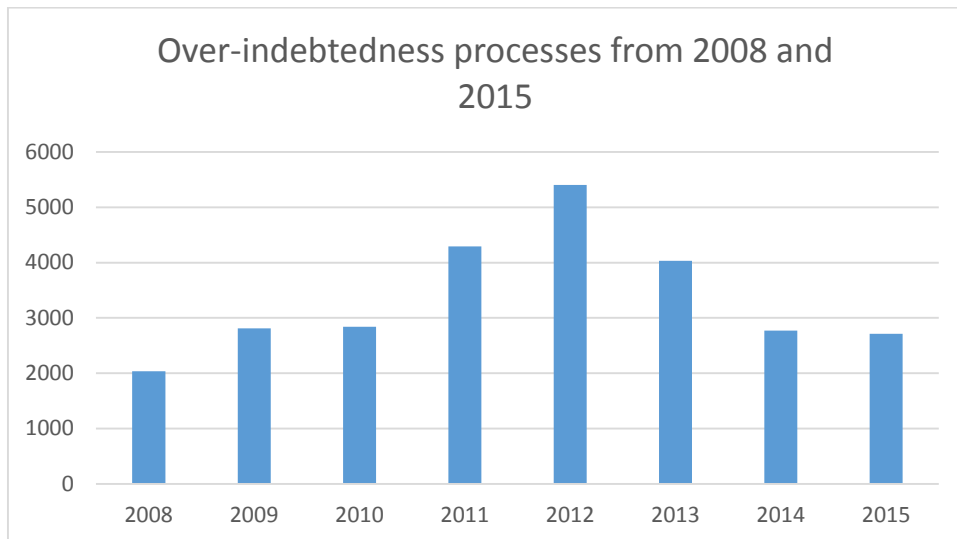
A study performed by DECO, 2013, 2015 shows the causes of over-indebtedness of the Portugal.

Figure 16 - Causes of Over-Indebtedness (%).



Source: DECO

Figure 17 - Over-indebtedness processes from 2008 and 2015



Source: DECO

In regard to the corrective measures, in 2013 it was created the "Rede de Apoio⁶ ao Consumidor Endividado" by legal persons from public and private law firms, recognized by the Directorate General for Consumer Protection, with the approval of the Bank of Portugal. This association operate independently throughout the country: "This network is made up of entities whose mission is to inform advice and

monitor bank customers who are at risk of default or already have outstanding credit installments. Access to these entities is free of charge."

According to the Bank of Portugal, bank customers which facing difficulties in meeting credit agreements have a set of rights established by law (Decree-Law No. 227/2012 of 25 October). The rights apply to the prevention and management of non-compliance with credit agreements.

However, for various reasons, some customers fall into debt or default situation. When banking customers facing difficulties in meeting credit agreements have a set of rights established by law. According to Bank of Portugal are three ways prevention of debt, RACE: *Pari Persi* e *Regime Extraordinário* (Table 2).

Table 2 Three ways to prevent of debt



Source: Bank of Portugal

4. Empirical Analysis

4.1. Introduction

This section has any intention to show how all the empirical process is going to be developed. First, it displays all the information related to the sample, which is used. Then, presented the he econometric model with the main explanatory variables and the dependent variable. Also, defined the econometric process, choosing the best methodology to test the hypothesis and evaluation of results.

The main problem is to estimate the model, which is the most appropriate to the theme "Determinants of indebtedness risk in the Portuguese families".

To investigate the problem of household's mortgage debt and over-indebtedness, we examined a many of explanatory variables, which have used in similar investigations. For the econometric analysis have given the estimation of statistical model, the Multiple Linear Regression Model, (MLRM), (Morais, 2013; Makri and Papadatos, 2014).

The research model consists of seven variables (see Table 3) with thirteen observations. Statistical data (as can be seen from Table 4) have presented as a time series, that is, data were collecting over time and in this particular case classified as quantitative. For analyze of our model, we have been using software GRETL. The statistical data introduced in software, using a statistical OLS model.

4.2. Definition of Hypotheses

Next, we will formulate a research hypothesis. Then, will be test of the hypothesis by using econometric model estimation, with database.

At this point, we intend to identify the determinants, which can influence of the indebtedness of Portuguese household, using the hypotheses. Thus, to study the models, have formulated the following hypothesis:

Macroeconomic environment affects the level of indebtedness of households.

4.3. Econometric Model

The Multiple Linear Regression is a linear regression by considering more than one independent variable. It is a statistical tool for understanding the relationship between a dependent variable Y (*Debt*) and more than one explanatory variable. The model allows us to find the causal effect of one variable on another or estimate the effect on Y (*Debt*) of a change in X1, while other included variables is constant.

The MLRM is a linear model, because it assumes the linear form, regression analysis allows us to estimate and evaluate the relationship between a certain variable (dependent variable) and several variables (independent variables), which refers to a multiple regression and is stochastic, because it involves an error term.

Econometrics aims to give empirical content to economic relations. More precisely, make "the quantitative analysis" estimating the coefficients or parameters the MLRM.

The Multiple Linear Regression Model, which was estimating according to the Method Ordinary Least Squares (OLS) to assess the impact of independent variables on the mortgage indebtedness. The least squares estimator is obtain by minimizing the error.

Based on the studies of (Louzis et al, 2012); (Meng, Hoang, Siriwardana, 2013); (Morais, 2013); and (Makri and Papadatos, 2014) cited in recent literature, we have applied a statistic temporal data approach to explain the determinants of the households' indebtedness in the Portugal mortgage market.

Therefore, the model is displayed as follows:

The Multiple Regression Model:

$$DebtGDP = \beta_0 + \beta_1 S + \beta_2 Cons + \beta_3 U + \beta_4 Inf + \beta_5 IR + \beta_6 IndexPH + \beta_7 GDPg + \varepsilon$$

Where Y – The dependent variable;

S, Cons, U, Inf, IR, IndexPH, GDPg - The independent variables (regressors);

β_0 - The parameter associated with the constant;

$\beta_1, \beta_2 \dots \beta_k$ – The constants and are called regression coefficients;

ε - The regression error (random variable).

4.4. Description of the Variables

For this study will be resort to an econometric model that has as dependent variable "Mortgage debt" Debt. The Debt index is the ratio of Total Mortgage Debt of Portuguese families to Gross Domestic Product, expressed as a percentage. We use Gross Domestic Product, because at the macro level, it' can be approximated to the households' income (Meng, Hoang, Siriwardana, 2013). The dependent variable is the ratio $Y = Debt = (Debt/GDP)$. The data for this variable have taken from the Bank of Portugal and INE. The autonomous component is (β_0) , is a constant, and is not influence by the different explanatory variables.

Table 3 - Independent variables used in the model

Variable		Description	Expected correlation with the dependent variable (alternatively the expected signal instead of the expected correlation)
Abbreviation	Significance		
Macroeconomic determinants			
(S)	Savings (In %).	This independent variable (<i>S</i>) represents the ratio of Total Saving of Portuguese families to Gross Domestic Product, expressed as a percentage. Represents the volume of saving. $S = S/GDP$	In view of the fact that families have reserve money or rather Saving, they can expect to receive mortgage that would increase the debt. Therefore, the increase in saving, leads to increase in debt.
(Cons)	Consumption (In %).	This independent variable (<i>Cons</i>) represents the ratio of Total Consumption of Portuguese families to Gross Domestic Product, expressed as a percentage. Represents volume that measures the total money spent by Portuguese households. $Cons = Cons/GDP$	The growth of consumption can increase the number of credits, which in turn leads to an increase in debt. It is expected to have a positive influence on indebtedness, since, the increased consumption can cause the debt increases.

(U)	Unemployment rate (In %)	The unemployment rate is an explanatory variable of the model, this variable (<i>U</i>) represents the annually unemployment rate in Portugal, in a percentage.	It is expected to have a negative impact on indebtedness, because increase unemployment rate can cause the debt to decrease, as the increase of unemployment rate can decrease the number of credits. However, it may increase debt, because families that fall into a situation of unemployment not have the funds to repay existing loans, what can have a positive impact
(Inf)	Inflation rate (In %)	Represents a sustained increase in the general price level of goods and services in an economy over a period. This variable (<i>Inf</i>) represents the annually percentage of inflation on the reduction in the purchasing power per unit of money in Portugal.	It is expected that the inflation rate has a negative impact on debt. The cost of living increase, as a result, households have less money to pay for loans. But on the other way as inflation rate increases this led to increases in the interest rate. This is a risk for household indebtedness. So, This variable can have double direction.
(IR)	Interesting rate (In %)	This variable (<i>IR</i>) represents the average percentage of interest rate of the mortgage in Portugal (in %).	Expected, that decrease interest rate has a positive impact on mortgage debt. And has negative impact on mortgage over-indebtedness, since a low Interest rate of the mortgage, turning payments more cheap for families;
GDPg	GDP grows (In %)	The "rate of economic growth" is an annual rate of growth in GDP between the first and the last year over a period. This variable (<i>GDPg</i>) represents the percentage an increase in economic growth in Portugal.	It is expected a positive impact on mortgage debt, since growing economies will provide better economic conditions and provide more opportunities of mortgage loan provided to households.

HPI	House Price Index (In %)	This variable (<i>HPI</i>) measures the price changes of all residential properties, both newly built and existing, purchased by households.	It is expected to have a positive impact on indebtedness since the amplitude of the volatility will influence the value of the asset or loans. On the other hand, can decrease prices down, making the borrowers have an asset that is less valuable, which leads to high financial costs over the asset, and therefore to the over-indebtedness on the mortgage, it have a positive impact. However, growth of IPH can decrease the number of mortgage, which leads to a negative impact.
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4.5. Data and Sample

Therefore, to conduct studies relating analysis of factors debt and over indebtedness on the credit market is considered a sample with a large number of macroeconomic data's in Portugal. To investigate the econometric models we use macroeconomic and financial variables.

In this particular case, for the study to be developed will build a database comprising data related to the largest possible number of statistical data of mortgage market and macroeconomic data. This is an intensive search for data from of all possible statistical resources held to obtain a sample as wide as possible.

Our final sample consisted of 13 annual observations extended from 2003 to 2015.

The data have obtained from the on-line four main sources:

Pordata <http://www.pordata.pt/>;

INE https://www.ine.pt/xportal/xmain?xpgid=ine_main&xpid=INE&xlang=pt ;

BPstat <http://www.bportugal.pt/EstatisticasWEB/> ;

European Central Bank <https://sdw.ecb.europa.eu/>.

The estimation of model is performed by using the econometric software Gretl 1.9.9. The model will be composed of seven independent / explanatory variables (as can be seen in Table 4, 5 and H), for example:

Table 4 - Variables used in the model

Debt = Y = Mortgage Debt / GDP

Abbreviation	Significance	Unit
S	Savings	%
Con	Private consumption	%
U	Unemployment rate	%
Inf	Inflation rate	%
IR	Interesting rate	%
GDPg	Gross Domestic Product grows	%
HPI	House Price Index	%

Table 5 - Database used in the model

	Debt	<i>S</i>	<i>Cons</i>	<i>U</i>	<i>Inf</i>	<i>IR</i>	<i>PHI</i>	<i>GDPg</i>
Year	%	%	%	%	%	%	%	%
2003	0.4545	0.070	0.631	6.3	3.2	3.8	94,7	-0.9
2004	0.4666	0.071	0.635	6.6	2.4	3.5	95,3	1.8
2005	0.5008	0.065	0.644	7.6	2.3	3.4	97,5	0.8
2006	0.5528	0.056	0.645	7.6	3.1	4.0	99,6	1.6
2007	0.5761	0.049	0.648	8.0	2.5	4.8	100,0	2.5
2008	0.5882	0.048	0.662	7.6	2.6	5.4	93,7	0.2
2009	0.6309	0.075	0.647	9.4	-0.8	2.7	92,4	-3.0
2010	0.6364	0.066	0.658	10.8	1.4	2.5	92,6	1.9
2011	0.6466	0.053	0.658	12.7	3.7	3.8	87,9	-1.8
2012	0.6563	0.055	0.663	15.5	2.8	3.9	82,5	-4.0
2013	0.6260	0.055	0.653	16.2	0.3	3.2	79,7	-1.1
2014	0.5908	0.040	0.659	13.9	-0.3	3.2	80,6	0.9
2015	0.5492	0.029	0.659	12.4	0.5	2.4	82,3	1.5

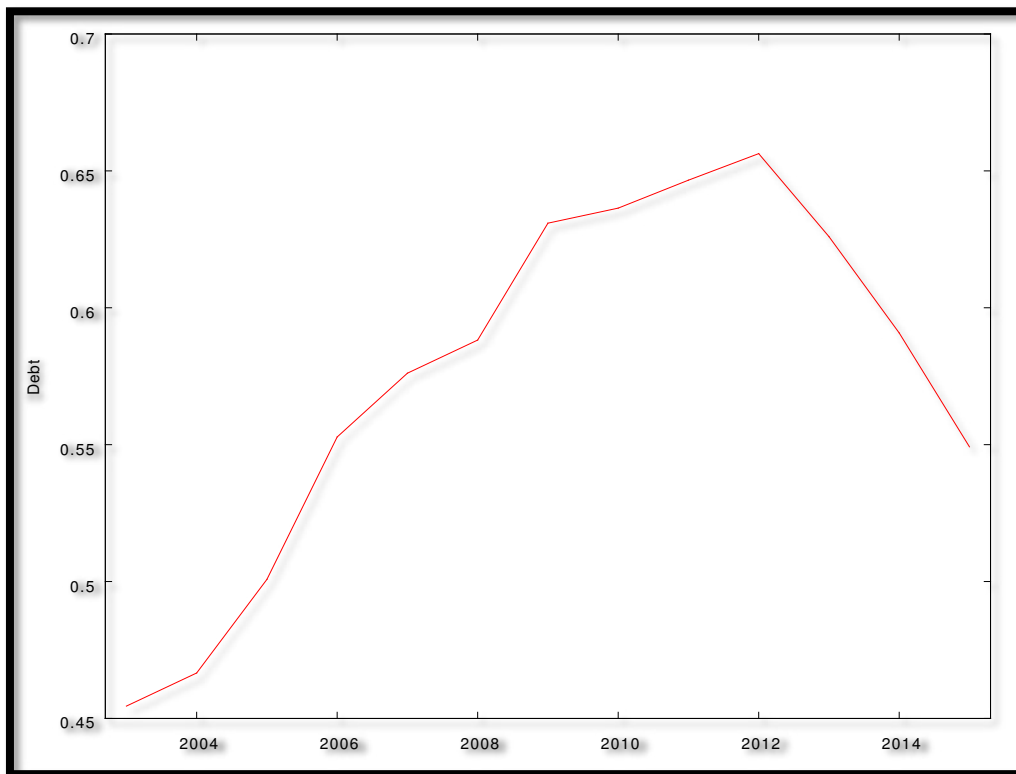
5. Empirical Results

5.1. Descriptive Statistics

Analyzing the time series of Debt graph 5.0, clearly showed us, that for many years the rate of mortgage debt of Portuguese household has been steadily increasing, and quite significantly, as from 2003 to 2012 increased about 20%, but over the past 3 years decreased by 10% and reached about 55% of GDP.

Debt is the indicator of volume of the mortgage credit market. Rate of debt of Portuguese household measured in this study by ratio of total mortgage loans to GDP.

Figure 18 - Mortgage debt growth rate graphic



Source: Prepared in software Gretl

Table 5 represents the descriptive statistics of the examined variables over the period 2003-2015. Regarding the volume of the mortgage credit market, the mean value of Mortgage Debt/GDP, (Debt) reaches the 57.5% and maximum reaches the 65.63%.

Table 6 - Descriptive Statistics of the examined variables

Descriptive statistics, using observations 2003 – 2015						
	Mean	Median	Minimum	Maximum	Std. Dev.	C.V.
DEBT	0.575 02	0.58820	0.45450	0.65630	0.067449	0.1173 0
S	0.056 41	0.05521 5	0.028809	0.075337	0.013172	0.2335 3
C	0.650 95	0.65275	0.63108	0.66278	0.010214	0.0156 91
UR	0.103 54	0.09400 0	0.063000	0.16200	0.034503	0.3332 4
InfR	0.017 46	0.02300 0	- 0.008000 0	0.037000	0.014033	0.8036 7
IR	0.035 85	0.03490 0	0.023800	0.054400	0.0086754	0.2419 7
IndexPH	0.906 66	0.92590	0.79660	1.0000	0.072665	0.0801 46
GDPg	0.000 307	0.00800 00	- 0.040000	0.025000	0.020340	66.106

Note: Where Debt/GDP is the volume of the mortgage credit market, S/GDP is the volume of the savings as a percentage of GDP, Con/GDP is the consumption as a percentage of GDP, INF is the annual average inflation rate, U is the unemployment rate, IR is the interest rate to mortgage loans, GDPg is the annual percentage growth rate of GDP (is a level of economic growth). DEBT is the public debt as a percentage of GDP. t corresponds to the examined year.

Source: Prepared in software Gretl

Saving, records a minimum of 2.88% across all time lags and a maximum of 7.53%. Consumption, records a minimum of 63.11% across all time lags and a maximum of 66.28%. Thereof, for the same period unemployment presents a minimum of 6.3% and a maximum of 16.2%. The unemployment rate is was increased in 2003 to 6.3% up to 16.2% in 2013 and decreased in 2015 to 12.4%. The mean value of inflation rate is 1.75%. The inflation rate is was a peak in 2011 with 3.7% and over the last four years about 0.3-0.5%. The interest rate presents a minimum of 2.4% and a maximum of 5.4%. The interest rate oscillation have had enough over the past years, a higher peak in 2008 with 5,44%, but has been decreased for last seven years, and in 2015 - to 2,38%. The mean value of Index price house about 90.66%, a maximum of 100% in 2007 and a minimum of - 79.66% in 2013. The mean value of GDP growth rate a 0.0308%, a maximum of 2.5% and a minimum of - 4.0%. The positive mean value indicate that over the period 2003-2015 Portugal marked by low but with positive economic growth.

5.2. Matrix Analysis

Matrix analysis is one of the simplest forms of statistical analysis, is a multivariate analysis (where multiple relations between multiple variables are examined simultaneously). It involves the analysis of two variables (X, Y), for determining the empirical relationship between them. The correlation coefficients indicate the degree of dependence between variables. These coefficients may vary between - 1 and 1. Analysis is helpful in testing simple hypotheses. When an independent variable is associated with, another independent expected that this degree is about zero, mean the variable is not statistically significant. However, if this level approaching 1 (table 7) means that the variables are interrelated and mutually explained, the model will have a higher statistical significance.

Table 7 - Correlation Matrix

Correlation coefficients, using observations 2003 - 2015								
5% critical value (bilateral) = 0.5529 for n = 13								
Debt	S	C	U	Inf	IR	IndexPH	GDPg	
1	-0.2078	0,7988	0.7104	-0.2596	-0.0846	-0.4778	-0.4628	Debt
	1	-0.6352	-0.4424	0.1396	0.0888	0.4901	-0.2553	S
		1	0.6879	-0.1886	0.0099	-0.5902	-0.1945	C
			1	-0.3606	-0.3570	-0.9113	-0.4444	U
				1	0.6075	0.4358	0.0018	Inf
					1	0.4120	0.0322	IR
						1	0.4247	PHI
							1	GDPg

Source: Prepared in software Gretl

After analyzing the correlation matrix table 7, we have given conclusion that the Debt is more correlated with Consumption and Unemployment rate while the Interest rate does not have such relationships with Debt. We can also see that the Saving is related to the Consumption; the Consumption with the Unemployment rate; the Unemployment rate with the House Price Index; the Inflation rate with the Interest rate.

5.3. The Results of the Model

In this subchapter, was estimated the estimation model, that was presented by the Method of Least Squares (OLS), verifying that the explanatory variables are significant at 1%, 5% or 10% significance level.

The results of OLS estimations for MRLM presented on Table 8, where the coefficients of the independent variables with their corresponding p-values.

Table 8 - Econometric Results Model

Model 1: OLS, using observations 2003-2015 (T = 13)				
Dependent variable: Debt				
Heteroskedasticity-robust standard errors, variant HC1				
	coefficient	std. error	t-ratio	p-value
const	-3.47088	0.403716	8.597	0.0004***
SGDP	1.13070	0.491169	2.302	0.0696*
ComGDP	4.69975	0.604936	7.769	0.0006***
U	1.86853	0.310577	6.016	0.0018***
Inf	-1.07130	0.746149	-1.436	0.2106
IR	0.407378	0.996169	0.4089	0.6995
IndexPH	0.809210	0.206221	3.924	0.0111***
GDPg	-0.712075	0.422264	-1.686	0.1005*
Mean dependent var 0.575015		S.D. dependent var 0.067449		
Sum squared resid 0.003392		S.E. of regression 0.026047		
R-squared 0.937864		Adjusted R-squared 0.850874		
F(7, 5) 29.62587		P-value(F) 0.000886		
Log-likelihood 35.18690		Akaike criterion -54.37381		
Schwarz criterion -49.85421		Hannan-Quinn -55.30279		
Rho -0.077702		Durbin-Watson 2.134451		
Note: Table shows the coefficients estimates and p-values of the OLS regression model.				
* Significance at the 10% level, **Significance at the 5% level, ***Significance at the 1% level.				

Source: Prepared in software Gretl

In formulated model can verify the level of significance of each variable and the appropriate test value is observed that at a significance level of 1% (p-value) are all variables very close to 0, there are const., C, U and HPI. S and GDPg are statistically significant at a 10%significance level and only Inf and IR are not statistically significant. Thus, we reject H0 if p-value $\leq \alpha$; $\alpha = 0, 05$. Concluding that the explanatory some variables are significant in explaining the model.

The use of Debt as indicator of volume of the mortgage credit market (Rate of indebtedness of Portuguese household) unveiled interesting results.

On the Model RLM, it is possible see that S, Con, U, IR and HPI have a positive effect, while Inf and GDPg have a negative to the volume of the mortgage credit market.

It should be noted that U does not exert significant impact on the volume of the indebtedness rate.

The explanatory variables are significant in explaining the model. It appears also the determination coefficient **R²** = 0.937864 - is high, which means that the estimated model is satisfactory, the explanatory variables, or reveal explaining about 94% of the dependent variable. We also note that the coefficient of determination (**R²**) is high, measuring the proportion that the explanatory variables explain the behavior of the variable - Debt.

Thus, there have obtained the Estimated Model:

$$\widehat{Debt} = -3.47088 + 1.13070 S + 4.69975 Cons + 1.86853 U - 1.07130 Inf +$$

$$(0.403716) \quad (0.491169) \quad (0.604936) \quad (0.310577) \quad (0.746149)$$

$$+ 0.407378 IR + 0.809210 IndexPh - 0.712075$$

$$(0.996169) \quad (0.206221) \quad (0.422264)$$

Coefficients of interpretation:

$\beta_0 = (-3.47088)$ – It is expected that the rate of mortgage indebtedness of Portuguese household decrease to 3.47088 p.p in case savings, consumption, Income, unemployment rate, inflation rate and the interest rate and HPI are null.

Hypothesis tests (T-Student)

A t-test is any statistical hypothesis test in which the test statistic follows a Student's t-distribution under the null hypothesis. It can be used to determine if two sets, the null hypothesis where coefficients are null and alternative hypothesis where coefficients are different from zero, that is:

Hypothesis Testing

$$H_0: \beta_i = 0 \Rightarrow \beta \text{ is not important to explain the DebtGDP}$$

$$H_1: \beta_i \neq 0 \Rightarrow \text{is important to explain the DebtGDP}$$

The observed t was calculated by the following expression:

$$\text{Herefrom } H_0, \quad T_{obs} = \frac{\hat{\beta}_i - c}{se(\hat{\beta}_i)} \sim T_{T-2}, \alpha/2$$

Rule of decision:

$$\text{Reject } H_0, \text{ se } |T_{obs}| > T_{critico}$$

$$\text{Not reject } H_0, \text{ se } |T_{obs}| < T_{critico}$$

Using the Gretl program, which estimate the OLS model, we obtained the following value for the critical t = 2.20099.

In the following table 9, we can verify the decision rule for each of the study variables analyzed.

Table 9 - Decision T-Student test

Variable	Test statistic	Decision
β_0	8.597	Reject H_0 ,
β_1	2.302	Reject H_0 ,
β_2	7.769	Reject H_0 ,
β_3	6.016	Reject H_0 ,
β_4	- 1.436	No Reject
β_5	0.4089	No Reject H_0 ,
β_6	3.924	Reject H_0 ,
β_7	-1.686	No Reject H_0 ,

Source: Prepared in software Gretl

We can reject our model because all but one variable of our model are satisfied.

Hypothesis tests (Fisher test)

In the Fisher test, it is also necessary to consider two hypotheses, the null hypothesis that the coefficients of all the variables are equal to zero and the alternative hypothesis that the sum of all coefficients is different from zero, that is:

Hypothesis Testing

$$H_0: \beta_0 = \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$$

$$H_1: \beta_i \neq 0$$

Note: The F has calculated using the following expression:

$$\text{Here from } H_0, \quad F_{obs} = \frac{\frac{R^2}{K-1}}{\frac{1-R^2}{n-K}} \sim T_{K,T-2}, \alpha/2$$

Rule of decision:

Reject H_0 , se $|F_{obs}| > F_{critico}$

Not reject H_0 , se $|F_{obs}| < F_{critico}$

Using the Gretl program, which estimate the model, we obtained the following value for the critical f.

Critical value = 3.66382

$$F_{obs} = 10.781236$$

As can be seen the F observed exceeds the F critical, it is located in the rejection, $10.78123563 > 3.66382$, therefore the null hypothesis is reject. Thus, it can be concluded that the model is valid since the set of estimated coefficients are statistically significant.

White heteroskedasticity test

Hypothesis Testing

$H_0: \beta_0 = \beta_1 = \beta_2 = \dots = \beta_j = 0 \rightarrow \text{Homoskedasticity } \sigma_1^2 = \sigma_2^2$

$H_1: \text{Pelo menos um } \beta_i \neq 0; j = 1, \dots, 21 \rightarrow \text{Heteroscedasticity } \sigma_1^2 \neq \sigma_2^2$

Here from $H_0, [TR_{aux}^2] \sim X_{22}^2; 0,05$

Using the software, it was determined:

$$LM_{obs} = [13 * 0.943083]$$

Rule of decision:

Reject H_0 , se $|LM_{obs}| > LM_{critico}$

Not reject H_0 , se $|LM_{obs}| < LM_{critico}$

Using the Gretl, which estimate the model, we obtained the following value:

Chi-square(13)	Unadjusted R-squared = 0.943083
right-tail probability = 0.05	
complementary probability = 0.95	Test statistic: $TR^2 = 12.260079$,
	with p-value = $P(\text{Chi-square}(13) > 12.260079) =$
Critical value = 22.362	0.199041

Source: Prepared in software Gretl

We conclude that for $\alpha = 5\%$, not reject H_0 . As follows, $|LM_{obs} = 12.260079| < LM_{critico} = 22.362$ Null hypothesis: heteroskedasticity not present, this means that there is no evidence Heteroscedasticity this model, and as such it is homoscedastic.

Autocorrelation hypothesis of errors - Durbin-Watson test

Durbin-Watson hypothesis test:

$$H_0: \rho = 0 \rightarrow \text{no autocorrelation.}$$

$$H_1: \rho > 0 \rightarrow \text{autocorrelation of errors}$$

$$DW = > 2 = 2.134451$$

$$d_L = 0.2305$$

$$d_U = 2.9851$$

Where $-1 \leq \rho \leq 1 \Leftrightarrow 0 \leq d \leq$

d	$[0, d_L[$	$[d_L, d_U[$	$[d_U, 4 - d_U[$	$[4 - d_U, 4 - d_L[$	$[4 - d_L, 4[$
Decisão	Rejeitar H_0 Dependência	Nada se pode concluir	Não rejeitar H_0 Independência	Nada se pode concluir	Rejeitar H_0 Dependência

Conclusion:

$$[d_U, 4 - d_U[= [2,9851; 4 - 2,9851[= [2,9851; 1,0149[$$

$$DW = 2,816855 \in [2,9851; 1,0149[$$

Thus, for $\alpha = 5\%$, do not reject H_0 , we can therefore assume that the errors are independent, meaning that checks the independence assumption. The negative correlation (-0.0672255) is not significant there is no autocorrelation.

The test Breush-Godfrev

H_0 : autocorrelation absence of terms of the perturbation error;

H_1 : autocorrelation existence of terms of the perturbation error.

Rule of decision:

Reject H_0 , se $|F_{obs}| > F_{critico}$

Not reject H_0 , se $|F_{obs}| < F_{critico}$

Using the Gretl program, which estimate the model, we obtained the following value for the critical
f.

$$F_{obs} = 6.18 \quad F_{crit} = 5.88637$$

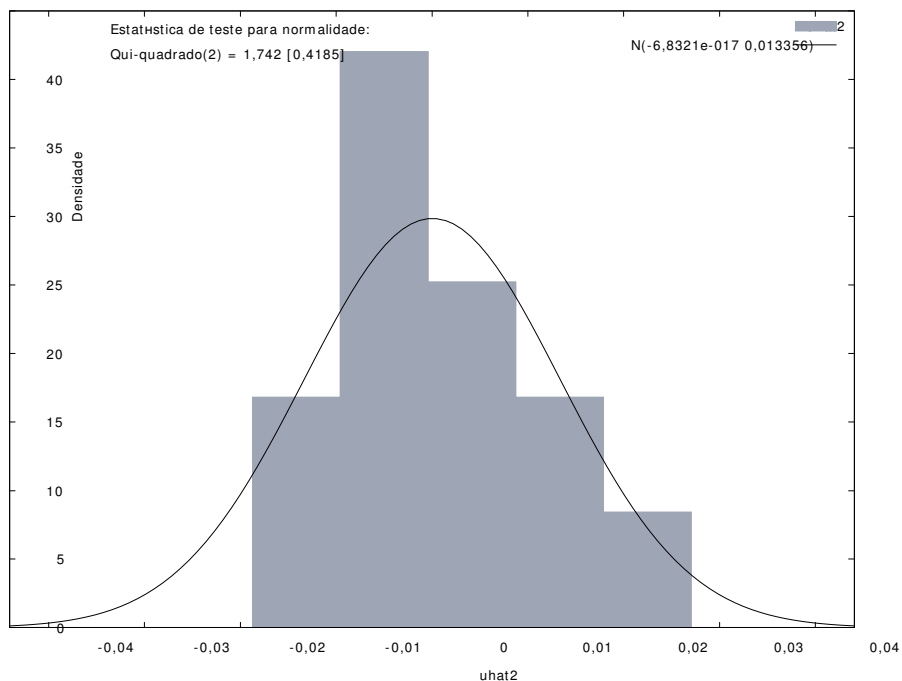
How $6.18 > 5.88637$, do reject H_0 , which leads to the conclusion that there is no autocorrelation of errors, so the model does not violate the hypothesis of autocorrelation of errors.

Hypothesis of normality

By observing, the graph above Normality residues, we can see that the estimated model residues was not normal distribution.

As at the beginning of this chapter, as in the histogram of normality residues we can also verify that, our distribution was not normal due to the small difference of the mean and the median.

Graph 19 - Normality residues



Source: Prepared in software Gretl

Test Jarque-Bera

$H_0: S = 0 \wedge K = 3 \rightarrow u_t$ There are normally distributed

$H_1: S \neq 0 \vee K \neq 3 \rightarrow u_t$ There are not normally distributed

$$S = -0.99741$$

$$K = 1.1796$$

$$JB = n * \left[\frac{S^2}{6} + \frac{(K - 3)^2}{24} \right] \sim X^2_{2;0,05}$$

$$JB = 3.95$$

$$X^2_{2;0,05} = 5.99146$$

Reject H_0 , if $JB_{obs} > X^2_{critico}$

We conclude that for $\alpha = 5\%$, not reject H_0 . The error terms, are not normally distributed in the model.

6. Discussion of Results

In this chapter of the thesis, comparison between the obtained results and expected results is made.

For this study, a Multi Linear Regression Method has been used, which, according to the literature, is easier to apply, and the results are easier to interpret. We obtained a sample that has the maximum possible information concerning households at both macroeconomic and financial levels.

Our sample consisted of a set of seven variables: savings, consumption, unemployment rate, inflation rate, interest rate, house price index, gross domestic product growth. In the table, 10 we can see the results expected and the results obtained. It can be verified that the obtained results concerning such variables as saving, consumption, HPI and inflation rate are equal to the expected ones.

Table 10 - Results Comparison

Variables	Resultados Esperados	Results Obtained
Saving	+	+
Consumption	+	+
Unemployment Rate	-+	+
Inflation Rate	-	-
Interest Rate	+-	+
HPI	+-	+
GDPg	+	-

According to the mentioned hypothesis «**The macro-economic conjuncture affects the level of indebtedness of households**», we can put forward to explore these hypotheses:

The **Saving** is positively associated with household indebtedness.

In the analysis of this hypothesis, S variable was used. This variable is statistically significant in the variation of the explanation dependent level of indebtedness of Portuguese household and presents statistical relevance to a 10% level of significance in explaining the dependent variable. Thus, it is concluded that the saving has influence. In addition, the hypothesis test showed a positive effect on changes in the level of debt of Portuguese households.

The private **Consumption** is positively associated with household debt.

In the analysis of this hypothesis, Cons variable was used. This variable is statistically significant in the variation of the explanation dependent level of indebtedness of Portuguese household and presents statistical relevance to a 1% level of significance in explaining the variation in the dependent variable. Thus, it is concluded that the change in the level of indebtedness of Portuguese households is influenced by such consumption with a positive influence. Thus, the hypothesis that we wanted to test was confirmed by the study carried out.

The **Unemployment Rate** is negatively associated with household indebtedness.

In the analysis of this hypothesis, U variable was used. This variable is statistically significant in the variation of the explanation dependent Indebtedness of Portuguese families and presents statistical relevance to a 1% level of significance. Thus, it is concluded that the change in the level of indebtedness of Portuguese households is influenced by the unemployment rate, in particular a positive influence. So the hypothesis testing was not found in the analysis.

The **Inflation Rate** is negatively associated with household debt.

In the analysis of this hypothesis, Inf variable was used. This variable is not statistically significant in the variation of the explanation dependent Indebtedness of Portuguese families, because it presents statistical relevance to a 20% level of significance in explaining the variation in the dependent variable. Thus, it is concluded that the change in the debt of Portuguese families is influenced by the inflation rate including a negative influence for the hypothesis to be tested it turned out in the examination.

The **Interest Rate** is negatively associated with household debt.

In the analysis of this hypothesis, IR variable was used. This variable is statistically significant in the variation of the explanation dependent Indebtedness of Portuguese families and has statistical significance at a 5% level of significance in explaining the variation in the dependent variable. Thus, it is concluded that the change in the debt of Portuguese families is influenced by interest rate including a positive influence. Thus, the hypothesis that we wanted to test was verified since the interest rate is linked to the debt in a negative way.

The **House Price Index** – is positively associated with household debt.

To analyze this hypothesis we used the HPI variable. This variable is statistically significant at the level of 5% in the explanation of the dependent variable mortgage debt of Portuguese households. Thus, it can be concluded that mortgage debt is influenced by HPI and has a positive impact on mortgage debt.

The **Grows GDP** – Economic growth positively affects the level of household debt.

In the analysis of this hypothesis, we used the GDPg variable. This variable is statistically significant at a level of 10% in the explanation of the dependent variable debt of Portuguese households. Thus, it can be concluded that mortgage debt is influenced by GDPg and has a negative impact on mortgage debt.

The expected result does not coincide with the obtained. The obtained result has shown that GDP growth has a negative impact on mortgage debt. It can be explained as followed: the Portuguese economy has experienced instability in recent years as a result of the international economic crisis and sovereign crisis. It was a difficult period, when GDP growth was negative, freezing credit markets, rising unemployment, increased taxes and the lack of wage growth. All this has made an impact on the economy as a whole.

After conducting the research and performing the analysis of the model, it can be concluded that all the variables used in the model are considerable. The variables play an important role in the studying model of indebtedness, because they satisfy the model.

We observed that some of the variables of the study were in agreement with the expected result, namely, the variable interest rate, index price house, saving and consumption with a positive effects on the mortgage debt. Inflation rate with a negative effect on the mortgage debt of Portuguese households. The variables such as the GDPg and the unemployment rate had a result obtained opposite to the expected result.

The results of our econometric analysis, provide strong evidence that hypothesis is confirmed. Thus, it is concluded that the change in the level of indebtedness of Portuguese households is influenced by the macro-economic conjuncture that has a positive or negative effect.

Conclusion

According to the literature review on debt and over-indebtedness, we can see that from the 1990s to the present day household indebtedness around the world has hit high records.

In Portugal, mortgage indebtedness rate has been characterized by a constant evolution, with indebtedness about 81.3% - in 2007 and 76.9% - in 2015 of disposable income and to 65.3% - in 2007 and 59.3 - in 2015 of GDP. As we can see, there was a slight decrease. The study of financial stability has become the key of modern macroeconomic policy, particularly for developed countries.

The main objective of this dissertation was to determine the determinants of the risk in mortgage indebtedness; to improve our understanding of credit risk, over-indebtedness risk; to analyze the factors of mortgage debt of Portugal nationwide.

The analysis of this study is based on macroeconomic and social data; during the study, it has shown us that these determinants or areas are not independent of each other but are often related and sometimes are intersected in the occurrence of an indebtedness process. This study works with general data of households, in order to assess the size and nature of the indebtedness of mortgage market.

This work has (led us through) two points of view about the indebtedness and over-indebtedness in mortgage credit of the Portuguese market. These points of view consist of the studying the relationships between several variables and mortgage indebtedness on the macro-economic and socio-economic levels.

For this study, a Multi-Regression Method has been used - which, according to the literature, is easier to apply, and the results are easier to interpret. We obtained a sample that has the maximum possible information concerning households at macroeconomic and financial levels. Our sample consisted of a set of seven variables: savings, consumption, income unemployment rate, inflation rate, interest rate, index price house, grows gross domestic product.

The information collected has limitations, which enables us to draw conclusions only from the macroeconomic side, not personal data of the Portuguese population in a state of over-indebtedness, on the part of social and economic factors. However, it is possible to point out in a minimally consistent way some trends, which can be important in understanding the phenomenon of over-indebtedness in our country from a macroeconomic side.

When analyzing the results obtained with the expected results, it can be concluded that some of the variables of the study were in agreement with the expected result, namely, the variable interest rate,

index price house, saving and consumption with a positive effects to the mortgage debt. Inflation rate with a negative effect to the mortgage debt of Portuguese households. The variables such as the GDPg and the unemployment rate had a result obtained opposite to the expected result. Specifically, it was observed a positive relationship between Debt and unemployment, supporting the view that unemployment reduces households' income and weakens borrower's ability to pay their loan instalments.

After conducting the research and the analysis of the model, it can be concluded that all variables used in the model are considerable. The variables are playing an important role in the studying model of indebtedness, because have satisfaction the model. In addition, after obtaining the results of the regression of the MRLM model, we can conclude that there was a link between the independent variables and the dependent variable.

The Portuguese economy has experienced instability in recent years as a result of the international economic crisis and sovereign crisis. Now, mortgages loans amount about 59.3% of Portuguese households and 80.1% of their total debt. Given that households have faced with a decrease of income, tax increase, increasing cost of life, etc., it appears that families make great efforts to reduce its debt.

Thus, it is concluded that the change in the level of indebtedness of Portuguese families is influenced by the macro-economic conjuncture that has a positive or negative effect. The results of our econometric analysis support the hypothesis that macroeconomic environment shows significant influence on the indebtedness risk of Portugal's household. The macroeconomic factors seem to determine the volume of the mortgage market, namely they have affect the households indebtedness level.

Since the mortgage covers about 80% of all loans to households, we can conclude that the mortgage plays a very important role in the banking system and in the development of several economic sectors. Mortgage is crucial in key economic sectors such as construction.

First, this thesis is unable to look at a mortgage indebtedness of a specific, personal household or group of individuals in order to verify what changes occurred over the years. Second, there was also a problem in obtaining more detailed information about the characteristics of households who are in a situation of over-indebtedness or debt on their mortgage loan concerning: the term of loan; interest rate; effort rate; loan-value ratio; property value; customer's age; income; marital status; education; etc. Due to the abovementioned problems encountered during the research, unfortunately, it was impossible to conduct the data analysis using the Logistic Regression Method – Logit or Probit model. Even though this model, according to the literature, is easier to apply, it is easier to interpret the results and the conclusions are drawn as a probability debt 1 or 0.

Suggestions for Future Investigations

After studying the Portugal household debt I feel it is necessary and I am willing to develop further and do some thoroughly work about this topic since it, is not only relevant now but also will be in the future. Further studies have to be performed to better understand this issue. Better data could capture the relations between macro-economic, personal variables and the rate of indebtedness, based on the characteristics of indebted and over-indebted households in Portugal. We will seek to identify the main characteristics of over-indebted households and shed some light on the main causes that lead to over-indebtedness.

Regular monitoring of the data and the determinants, such as socio-economic, personal, financial, macro and micro-economic ones, is necessary in order to safeguard and mitigate the negative consequences for the Portuguese economy and for the financial stability of the households.

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<http://clientebancario.bportugal.pt/pt-PT/TaxasJuroCambio/TaxasdeJuro/Paginas/Tipostaxasdejuro.aspx>³

<http://clientebancario.bportugal.pt/pt-PT/TaxasJuroCambio/TaxasdeJuro/Paginas/Spread.aspx>⁴

<http://clientebancario.bportugal.pt/pt-PT/TaxasJuroCambio/TaxasdeJuro/Paginas/IndexanteEuribor.aspx>⁵

<http://clientebancario.bportugal.pt/pt-PT/Credito/ApoioSobreEndividamento/Paginas/ApoioSobreEndividamento.aspx>⁶

Appendix

Figure A – Saving growth rate graphic

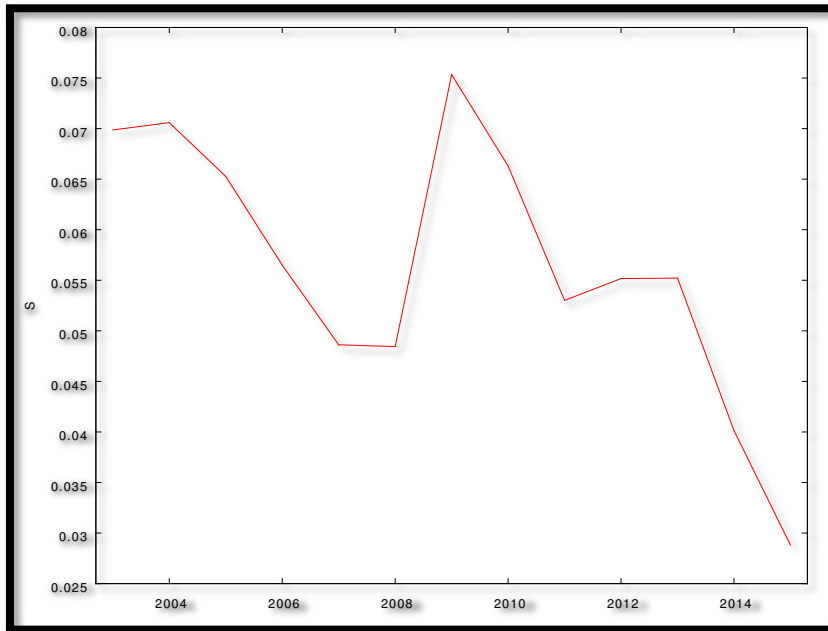


Figure B - Consumption growth rate graphic

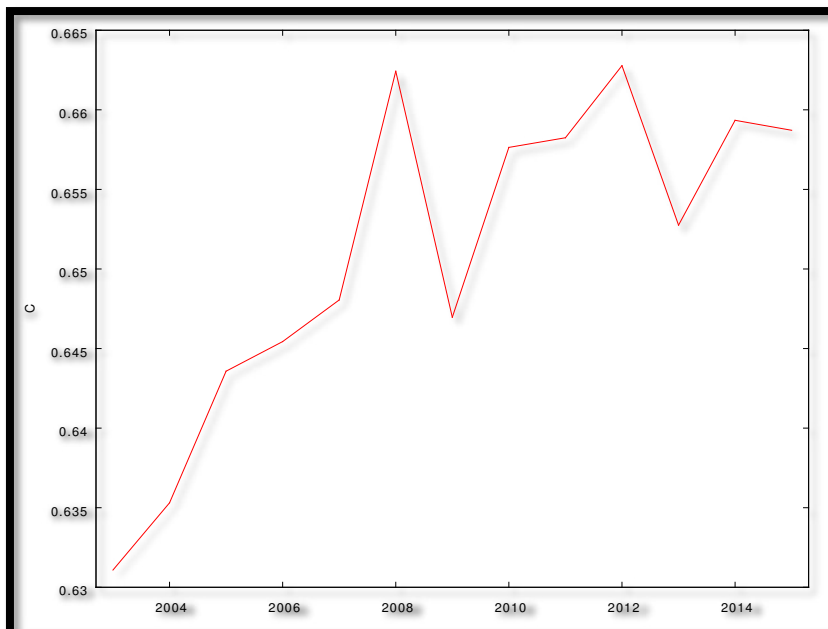


Figure C – Unemployment rate graphic

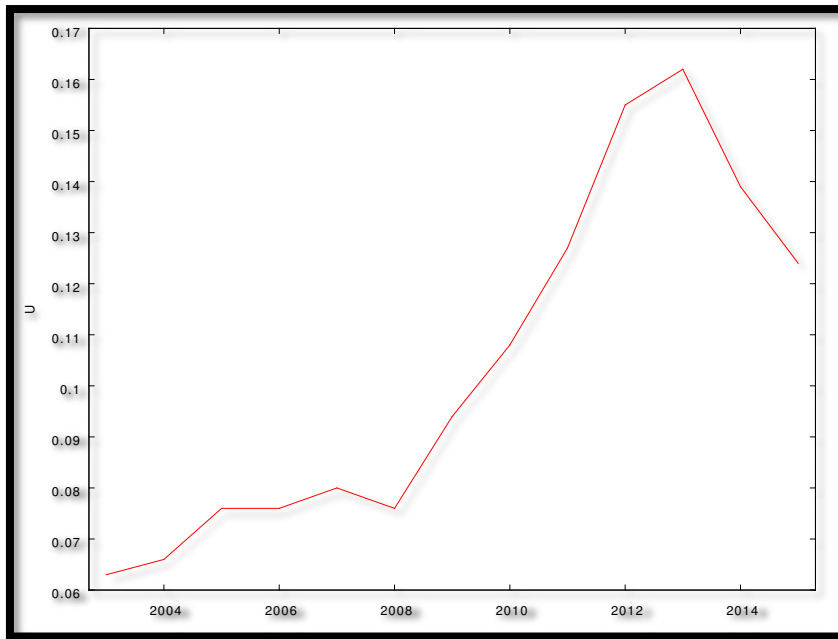


Figure D – Inflation rate graphic

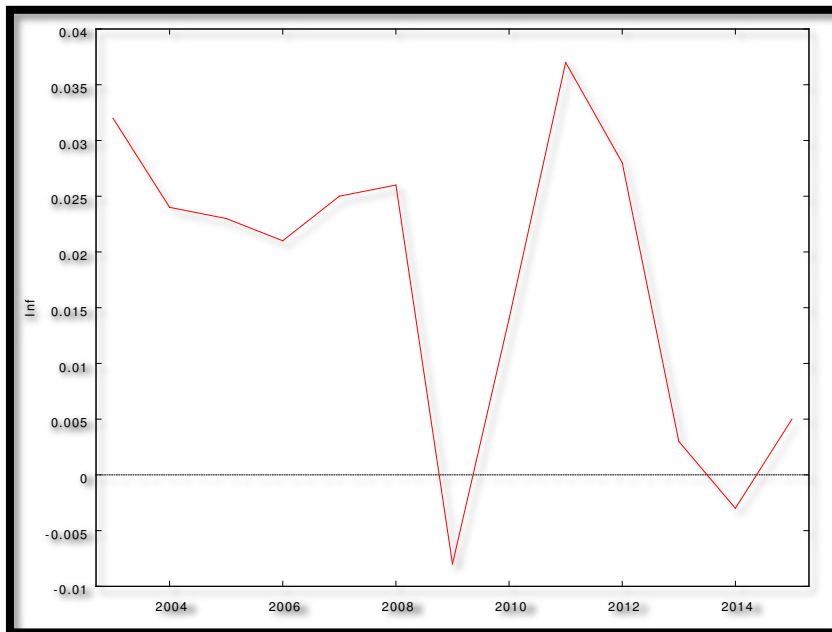


Figure E – Interest rate graphic

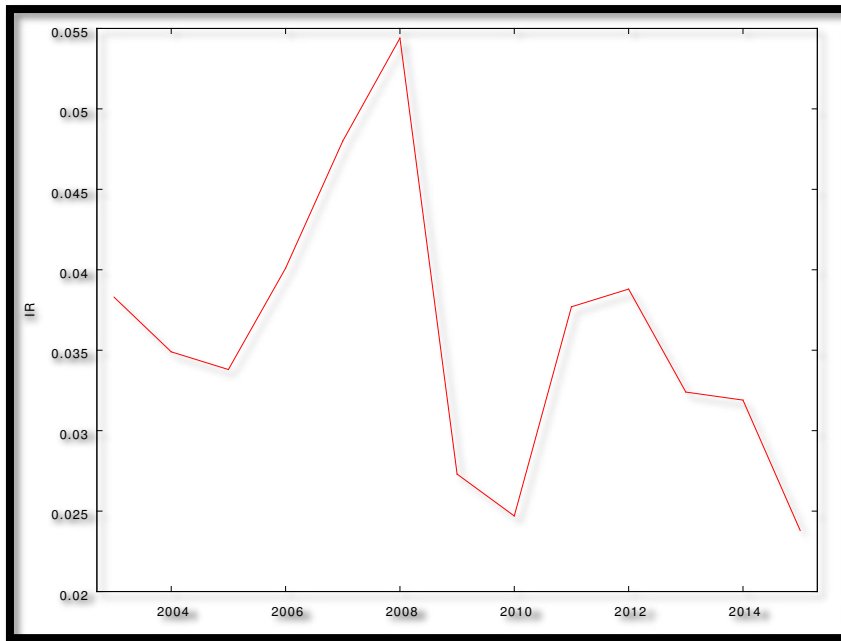


Figure F – House Price growth rate graphic

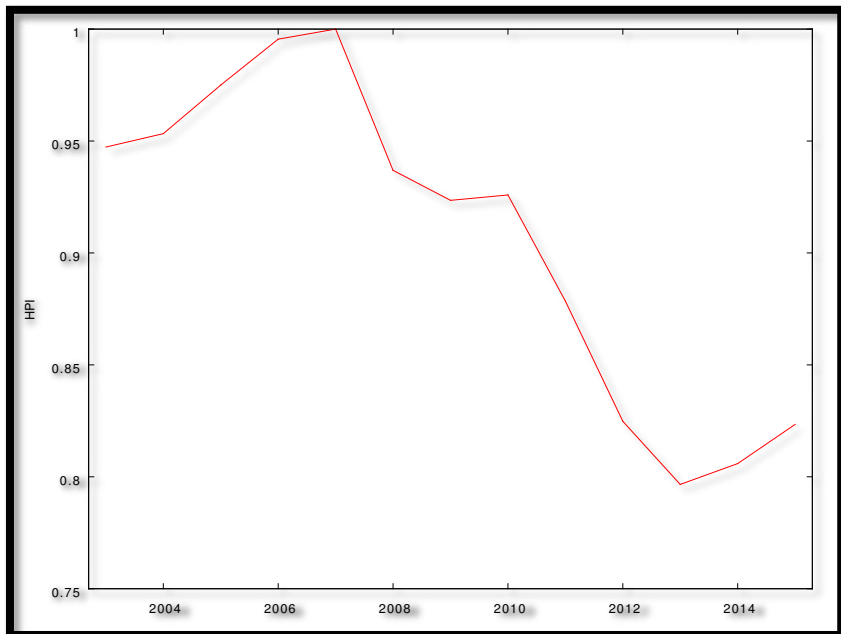
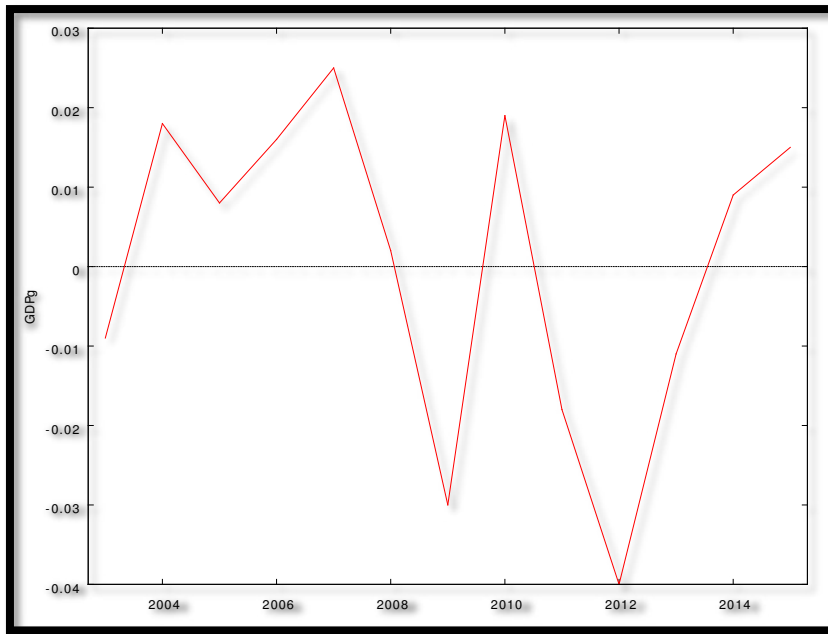


Figure G – GDP growth rate graphic



<i>Year</i>	Table H - Database used in the model												
	<i>Cons</i>	<i>S</i>	<i>GDP</i>	<i>MDebt</i>	<i>GDPg</i>	<i>PHI</i>	<i>IR</i>	<i>Inf</i>	<i>U</i>	<i>Cons</i>	<i>S</i>	<i>Debt</i>	
	10 ⁶ Euro	10 ⁶ Euro	10 ⁶ Euro	10 ⁶ Euro	%	%	%	%	%	%	%	%	
2003	92 238	10 211,60	146 158 277	66 425	-0.9	94,7	3.8	3.2	6.3	0.631	0.070	0.4545	
2004	96 803	10 755,40	152 371 562	71 101	1.8	95,3	3.5	2.4	6.6	0.635	0.071	0.4666	
2005	102 106	10 355,30	158 652 55	79 452	0.8	97,5	3.4	2.3	7.6	0.644	0.065	0.5008	
2006	107 303	9 392,20	166 248 715	91 896	1.6	99,6	4.0	3.1	7.6	0.645	0.056	0.5528	
2007	113 713	8 530,90	175 467 717	101 094	2.5	100	4.8	2.5	8.0	0.648	0.049	0.5761	
2008	118 490	8 665,40	178 872 582	105 209	0.2	93,7	5.4	2.6	7.6	0.662	0.048	0.5882	
2009	113 509	13 217,80	175 448 190	110 685	-3.0	92,4	2.7	-0.8	9.4	0.647	0.075	0.6309	
2010	118 329	11 929,80	179 929 812	114 515	1.9	92,6	2.5	1.4	10.8	0.658	0.066	0.6364	
2011	115 961	9 339,10	176 166 578	113 916	-1.8	87,9	3.8	3.7	12.7	0.658	0.053	0.6466	
2012	111 610	9 290,40	168 397 969	110 520	-4.0	82,5	3.9	2.8	15.5	0.663	0.055	0.6563	
2013	111 144	9 401,40	170 269 327	106 585	-1.1	79,7	3.2	0.3	16.2	0.653	0.055	0.6260	
2014	114 360	6 961,30	173 446 191	102 469	0.9	80,6	3.2	-0.3	13.9	0.659	0.040	0.5908	
2015	118 160	5 167,70	179 378 875	98 516	1.5	82,3	2.4	0.5	12.4	0.659	0.029	0.5492	